SMITHSONIAN INSTITUTION
UNITED STATES NATIONAL MUSEUM
Bulletin 60

THE BARNACLES (CIRRIPEDIA) CONTAINED IN THE COLLECTIONS OF THE U. S. NATIONAL MUSEUM

BY

HENRY A. PILSBRY

Special Curator of the Department of Mollusca, Academy of Natural Sciences of Philadelphia

WASHINGTON
GOVERNMENT PRINTING OFFICE
1907

Published November 8, 1905.

Published November 8, 1907.

ADVERTISEMENT.

The scientific publications of the National Museum consist of two series—the *Bulletin* and the *Proceedings.*

The *Bulletin*, publication of which was begun in 1875, is a series of more or less extensive works intended to illustrate the collections of the United States National Museum and, with the exception noted below, is issued separately. These bulletins are monographic in scope and are devoted principally to the discussion of large zoological and botanical groups, faunas and floras, bibliographies of eminent naturalists, reports of expeditions, etc. They are usually of octavo size, although a quarto form, known as the Special Bulletin, has been adopted in a few instances in which a larger page was deemed indispensable.

This work forms No. 60 of the Bulletin series.

Since 1902 the volumes of the series known as "Contributions from the National Herbarium," and containing papers relating to the botanical collections of the Museum, have been published as bulletins.

The *Proceedings*, the first volume of which was issued in 1878, are intended as a medium of publication of brief original papers based on the collections of the National Museum, and setting forth newly acquired facts in biology, anthropology, and geology derived therefrom, or containing descriptions of new forms and revisions of limited groups. A volume is issued annually, or oftener, for distribution to libraries and scientific establishments, and in view of the importance of the more prompt dissemination of new facts a limited edition of each paper is printed in pamphlet form in advance.

CHARLES D. WALCOTT,
Secretary of the Smithsonian Institution.

WASHINGTON, U. S. A., *October 8, 1907.*

TABLE OF CONTENTS.

LIST OF ILLUSTRATIONS.

TEXT FIGURES.

PLATES.

THE BARNACLES (CIRRIPEDIA) CONTAINED IN THE COLLECTIONS OF THE U. S. NATIONAL MUSEUM.

By Henry A. Pilsbry,

Special Curator of the Department of Mollusca, Academy of Natural Sciences of Philadelphia.

INTRODUCTION.

The collection of Cirripedes in the United States National Museum contains material derived from many sources. The most extensive series was received from the United States Bureau of Fisheries, and is due to the work of the steamers *Albatross* and *Fish Hawk* during the past twenty-five years or more in both Atlantic and Pacific waters. A considerable series of European forms was included in the Jeffreys collection of mollusks purchased by the United States National Museum, most of them preserved dry. Smaller accessions from many localities, chiefly American, are the gifts of friends of the Museum. From these several sources a good representation of the shore and pelagic forms of both Atlantic and Pacific coasts has been obtained, with a rich though doubtless incomplete fauna of the deep-water cirripedes of the east coast, and a much less complete collection of those of the west.

The present paper deals with the pedunculate cirripedes and the sessile family Verrucidæ only. All species represented in the National Museum are mentioned or described, and incidentally all known species of the United States and adjacent waters are treated monographically, though descriptive matter relating to well-known forms is restricted to keys for the determination of species.[a] Up to this time only about a dozen species of pedunculate cirripedes have been recorded

[a]The present paper should be used in connection with the writer's reports on Hawaiian and West American Cirripedes, Bulletin of the U. S. Fish Commission, XXVI, pp. 179-204, which also deal with material in the National Museum. Species discussed in those reports are mentioned herein only when additional material has come to hand.

from North American waters, and no Verrucidæ. The Pedunculata now known from our coasts number 56 species and 9 subspecies, and the Verrucidæ 5 species and 1 subspecies.

A few notes on the distribution of the species may be useful. With one exception, all of our pelagic cirripedes are very widely distributed forms, already known, from many Atlantic and Pacific localities. One pelagic species, *Alepas pacifica*, materially enlarges our knowledge of a small and little-known group of forms commensal on large medusæ. Those having opportunity should especially look for barnacles of this type.

The deep-water forms, both of Lepadidæ and Verrucidæ, support the opinions advanced by Hoek, Annandale, and others that deep-sea cirripedes have a very wide distribution. The deep-water fauna of the Atlantic is fairly homogeneous, many of the species from off our coast being very closely related to those from the Azores and eastward, while some species of *Scalpellum* range from off Nova Scotia to southern Europe and south to Tristan da Cunha. The number of very large species of *Scalpellum*, *Pœcilasma*, and *Verruca*, found off our east coast, is unequaled, so far as I know, in any area of equal extent. A considerable number of North Atlantic species stand very close to Pacific and Indian Ocean forms, and a few are probably identical specifically.

Exclusive of pelagic forms, the species of the Atlantic and Pacific coasts of the United States are distinct, with possibly one exception,[a] but several of the Californian species are closely related to those of the Atlantic.

From the very scanty data at hand it seems that the Antillean region is an area of specific differentiation, a number of very distinct specific types, not related to known Atlantic forms, occurring there. A comparison of this fauna with the Panamic will doubtless prove interesting, but nothing is yet known of Panamic cirripedes.

In the generic nomenclature I have been obliged to make various changes from the ordinary usage, yet only in cases where the universally accepted rules of priority have been transgressed. A few new generic and subgeneric terms are introduced, chiefly for groups nearly or quite unknown in the time of Darwin.

The privilege of studying these barnacles I owe to Dr. Richard Rathbun, assistant secretary in charge of the United States National Museum. I am indebted also to Prof. G. O. Sars for the gift of examples of *Scalpellum*. Finally I must thank Miss Helen Winchester for her careful work in drawing the illustrations for this paper.

[a] *Scalpellum regium latidorsum*, an Atlantic form, specimens of which are labeled as from a station off British Columbia. No Pacific species was taken with them.

Family LEPADIDÆ Darwin.

Cirripedia having a peduncle, flexible and provided with muscles. Scuta furnished only with an adductor muscle; other valves, when present, not united into an immovable ring (Darwin).

Professor Gruvel has proposed to dismember the family Lepadidæ, recognizing four families, nearly corresponding with the groups herein recognized as subfamilies, thus:

Polyaspidæ Gruvel = Scalpellinæ.

Pentaspidæ Gruvel = Lepadinæ + *Conchoderma* and *Oxynaspis*.

Tetraspidæ Gruvel = Iblinæ.

Anaspidæ Gruvel = Alepadinæ — *Conchoderma*.

I would probably have accepted Gruvel's families had the names been based upon generic terms; yet in that case I would be disposed to place *Oxynaspis* with *Scalpellum* rather than with *Lepas*, and on account of the structure of the scutum I would group *Conchoderma* with *Alepas*, though the armature of the cirri is different, and may indicate a closer relation to the pentaspidian group.

The terminology of the external parts of pedunculate barnacles is sufficiently explained by the following diagrams:

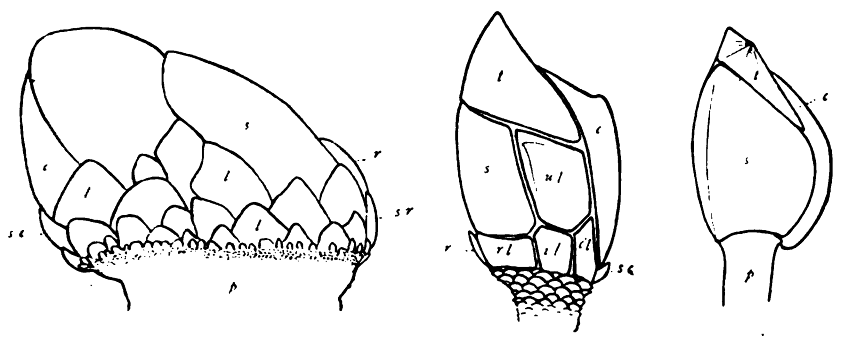


FIG. 1.—LATERAL VIEWS OF (*A*) MITELLA, (*B*) SCALPELLUM, AND (*C*) LEPAS. *c*, CARINA; *cl*, CARINAL LATUS; *il*, INFRAMEDIAN LATUS; *l*, LATERA; *p*, PEDUNCLE; *r*, ROSTRUM; *rl*, ROSTRAL LATUS; *s*, SCUTUM; *sc*, SUBCARINA; *t*, TERGUM, *ul*, UPPER LATUS.

KEY TO THE GENERA OF LEPADIDÆ.[a]

a. Umbones of scuta and carina above the middle of the plates or apical; a basal whorl of plates below the principal five; peduncle scaly.

Subfamily SCALPELLINÆ.

b. Valves 18 or more, all with apical umbones; latera in the basal whorl numerous.

Genus *Mitella*.

bb. Valves 12 to 15, the basal whorl of plates with 2 or 3 pairs of latera.

Genus *Scalpellum*.

[a] With the exception of *Ibla*, all the genera included in this key occur in North American waters. Only such genera as are treated of in the following pages are included in the key.

bbb. Valves 8, all with apical umbones, and finely crenated lines of growth, the scuta, terga, and carina large, rostrum and one pair of latera small; peduncle covered with small scales, those of the upper row crenated; terminating at the base in a calcareous cup or row of disks ....Genus *Lithotrya.*

aa. Umbones of scuta and terga apical, no other valves present; peduncle covered with chitinous spines..Subfamily IBLINÆ.

b. Valves 4; characters those of the subfamily ....Genus *Ibla.*

aaa. Valves 5; terga, scuta, and carina large, the latter two having umbones slightly above the middle of the plates; carina angularly bent; peduncle with calcareous spines...........Subfamily OXYNASPIDINÆ. Genus *Oxynaspis.*

aaaa. Valves 3 to 5; carina with the two ends unlike, the umbo basal or below the middle; umbo of scutum at or near the rostral angle; caudal appendages one-jointed; peduncle nude...............................Subfamily LEPADINÆ.

b. Plates fully calcified, approximate.

c. Carina extending upward between the terga; one or more lateral filaments at bases of first cirri; caudal appendages smooth ....Genus *Lepas.*

cc. Carina extending to the base of the terga, truncate at base; no lateral filaments; caudal appendages spinose.

d. Carina narrow throughout ....Genus *Pœcilasma.*

dd. Carina with wide sides toward the base ....Genus *Megalasma.*

bb. Plates incompletely calcified, the hard portions separated by wide chitinous spaces; scutum calcified in two or three diverging branches; carina terminating below in a disk, cup, or fork at the base of the capitulum. Valves 5 or sometimes apparently 7 ....Genus *Octolasmis.*

aaaaa. Valves wanting, or greatly reduced, widely separated and inconspicuous, scuta when present with the umbones near the middle of the occludent margin. Subfamily ALEPADINÆ.

b. Valves 2 to 5, very small; carina, when present, with the upper and lower ends nearly alike; lateral filaments at bases of first pair of cirri; caudal appendages wanting. Living attached to floating objects ....Genus *Conchoderma.*

bb. Only a pair of vestigeal scuta developed; integument thin, without internal muscular layer; cirri unusually short, composed of few joints; caudal appendages one-jointed. Living attached to medusæ...............Genus *Alepas.*

bbb. Capitulum wholly without plates, or with a pair of vestigeal scuta, a muscular layer underlying the integument; cirri long; caudal appendages well developed, composed of several spinose segments. Living attached to objects on the bottom...... ....Genus *Heteralepas.*

Subfamily SCALPELLINÆ.

Genus MITELLA Oken.

1815. *Mitella* OKEN, Lehrbuch der Zoologie, I, p. 362, for *Lepas pollicipes.*
1817. *Pollicipes* LEACH, Journal de Physique, LXXXV, p. 68, July, 1817, no type mentioned.
1851. *Pollicipes* DARWIN, Monograph on the Cirripedia, p. 293, and of authors.
1904. *Vaucheria* PALLARY, Journal de Conchyliologie, LII, p. 7.

It is much to be regretted that Darwin allowed the general use of the name *Pollicipes* to influence his course in rejecting the earliest generic name for this group, contrary, as he writes, to the rules of the British Association. Had he accepted the earliest name, it would long ago have become universally current. As matters stand we have no option ₎ the generic term *Mitella*, which Darwin himself showed to

be prior to *Pollicipes*. The supposed new genus *Vaucheria* was based on the scutum of *Mitella pollicipes*, which was thought to be the internal shell of a slug.

The few species of *Mitella* are littoral barnacles, often extremely abundant. The eastern American shores are without species; but one occurs on the west coast.

MITELLA POLLICIPES (Gmelin).

1790. *Lepas pollicipes* GMELIN, Syst. Nat., 13th ed., p. 3213 (in Mari Mediterraneo).
1790. *Lepas gallorum* SPENGLER, Skrifter Naturhist. Selskabet, I, pl. VI, fig. 9.
1824. *Pollicipes cornucopia* LEACH, Encycl. Brit., Suppl. III, and of DARWIN, Monograph on the Cirripedia, 1851, p. 298, pl. VII, fig. 1, and subsequent authors.
1904. *Vaucheria tingitana* PALLARY, Journ. de Conchyliologie, LII, p. 7, pl. III, figs. 2, 3, 4.

Localities.—No. 13008, U.S.N.M., France, Thos. Wilson. No. 12377, Gulf of Gascony, J. Gwyn Jeffreys collection. No. 12392, Biarritz, "eatable and sold in the market," Jeffreys collection. Ile Dieu, Ocèan, Isaac Lea collection.

MITELLA POLYMERUS (Sowerby).

1833. *Pollicipes polymerus* SOWERBY, Proc. Zool. Soc. Lond., p. 74 (coast of California).
1851. *Pollicipes polymerus* Sowerby, DARWIN, Monograph on the Cirripedia, p. 307, pl. VII, fig. 2.

Localities.—Plover Bay, near Bering Strait, Siberia, associated with *Conchoderma auritum* and *Coronula diadema*, on a humpback whale (*Megaptera versabilis* Cope), taken by Captain Redfield, W. H. Dall, Western Union Telegraph Expedition, 1865. No. 6609, Tledoo village, near Susk, British Columbia, James G. Swan. No. 32889, Barclay Sound, British Columbia, *Albatross*. No. 9203, Neah Bay, Washington, James G. Swan. Mouth of Columbia River, Raymond. No. 32883, "Upper California," T. Nuttall, as *P. mortoni* Conrad. Isaac Lea collection. No. 32887, Drakes Bay, California, *Albatross*. No. 3083, Wilmington, California, D. S. Jordan. No. 32890, Monterey Bay, W. H. Dall. No. 11145, Santa Rosa Island, California, P. Schumacher. Nos. 2547, 11152 (and 28510?), San Diego, California, C. R. Orcutt, O. N. Sanford, and Edgar A. Mearns, U. S. Army. No. 32888, San Quentin Bay, Lower California. No. 32882, Rosario, Lower California.

This common species of the west coast is readily known by the numerous irregularly arranged scales at the base of the capitulum. The valves are usually much worn, and the peduncle is covered with very fine scales. Dr. W. H. Dall took specimens from a humpback whale in Bering Sea, the highest latitude known for a member of this genus. These specimens I at first thought were *M. pollicipes*, as they have lost many of the lower plates, perhaps by the solvent action of the preservative. *(Fig. 1A.)*

MITELLA MITELLA (Linnaeus).

1758. *Lepas mitella* LINNÆUS, Syst. Nat., 10th ed., p. 668.
1851. *Pollicipes mitella* DARWIN, Monograph on the Cirripedia, p. 316, pl. VII, fig. 3.

Localities.—No. 32891, Pago Pago, Tutuila, Samoan Islands, Sir Charles Eliot. Sumatra, I. Lea collection. No. 32880, Turon Bay, Cochin China, Isaac Lea collection. No. 32881, Hongkong, China, Wm. Stimpson; North Pacific Exploring Expedition. No. 32892, Fusan, Korea, P. L. Jouy. Nos. 22392, 25379, and 26708, Japan, R. Hitchcock and H. Loomis. No. 16295, near Enoshima, Japan, F. Stearns.

Genus LITHOTRYA Sowerby.

1851. *Lithotrya* DARWIN, Monograph on the Cirripedia, Lepadidæ, p. 332.

LITHOTRYA PACIFICA Borradaile.

1900. *L. pacifica* BORRADAILE, Proc. Zool. Soc., p. 798, pl. LI, figs. 3, 3*a* (Funafuti, outer reef).

Localities.—Makemo, Paumotus, on the reef, *Albatross*, October 21, 1899. Funafuti, Ellice Islands, reef, *Albatross*, December 24, 1899.

This form is probably not distinct specifically from *L. nicobarica* Reinhardt, which, however, has the lateral plate shorter. Many of the specimens taken at Paumotus are much larger than Borradaile's type. An adult but not old example measures: total length, 62 mm.; length of carina, 19.5 mm.; carino-rostral diameter of capitulum, 15 mm. A small example was collected at Funafuti, the type locality.

LITHOTRYA DORSALIS (Ellis).

1851. *L. dorsalis* ELLIS in Darwin, Monograph on the Cirripedia, Lepadidæ, p. 351.

Localities.—No. 11529, San Salvador, *Albatross*, 1886. Specimens are also reported as in the Museum from Jamaica and Porto Rico.

Genus SCALPELLUM Leach.

1817. *Scalpellum* LEACH, Journal de Physique, de Chimie, d'histoire naturelle et des arts, LXXXV, p. 68.
1851. DARWIN, Monograph on the Cirripedia, Lepadidæ, p. 215.
1883. HOEK, Challenger Report, VIII, Cirripedia, p. 59.
1905. GRUVEL, Monographie des Cirrhipèdes, p. 23.

Scalpellum is much the largest and most varied genus of Pedunculate cirripedes, numbering about 140 species. The types of 38 species and 7 subspecies are in the collection of the Museum. A very large proportion of the species occur in depths of over 100 fathoms, and new forms are constantly brought to light by the various expeditions for

the exploration of the sea bottom. The number of species known is probably only a fraction of those actually existing.

The current classification of the species of *Scalpellum* we owe to Dr. Hoek, who composed this scheme of the major groups:

A. Valves imperfectly calcified.
B. Valves perfectly calcified.
  A. A portion of the carina projecting freely.
  B. Carina angularly bent.
  C. Carina simply bowed.
    A. With a subcarina.
    B. Without a subcarina.
      a. Species with a rostrum.
      b. Species without a rostrum.

While this grouping and its amplification in Hoek's key to the species and in Gruvel's later monograph has been of enormous assistance to subsequent students, yet it often fails to show the true relationships of many of the species now known, owing to the fact that *the shape of the carina and the presence or absence of a rostrum are characters in which there is diversity among very closely related species*. I need only instance *S. stroemii* and its immediate allies, forms no doubt closely akin, yet distributed into two of Hoek's divisions by the characters of the carina; and the species related to *S. velutinum*, some of which have a small rostrum, others none. Whether a more natural key will also prove more convenient in practical use than one employing artificial characters remains to be tested. An attempt is made below to indicate the natural groups within the genus, so far as I can determine them by the material before me. The data existing on the complemental males supports the new classification proposed.

KEY TO SUBGENERA AND SECTIONS OF THE GENUS SCALPELLUM.

a. Female and hermaphrodite with a subcarina; male with a distinct capitulum and peduncle.
  b. Only the tergum interposed between the scutum and carina; capitulum *Pollicipes*-like; male with the capitulum protected by 6 well-developed plates .... I. Subgenus *Calantica*, p. 8.
  bb. An upper lateral plate interposed below the tergum, between scutum and carina; capitulum resembling that of normal *Scalpellum* in general shape.
II. Subgenus *Smilium*, p. 13.
aa. No subcarina present; upper lateral plate occupying the middle of the side of the capitulum; male oblong, not divided into capitulum and peduncle, with minute valves or none.................................. Subgenus *Scalpellum*.
  b. Plates well calcified, none of them V-shaped.
    c. Inframedian latus large, subquadrate, pentagonal or rounded-oval, wide in the upper part, the umbo not above the middle.
III. Section *Scalpellum*, *s. str.*, p. 13.

cc. Inframedian latus small or narrow, triangular, hourglass-shaped, or irregular.

d. Rostral latus low, usually twice as wide as high.
IV. Section *Holoscalpellum*, p. 25.

dd. Rostral latus usually as high as wide, with short basal margin.
V. Section—p. 47.

bb. Plates imperfectly calcified, at least the tergum V-shaped.[a]
VI. Section *Neoscalpellum*, p. 69.

Keys to the species described in this report, and incidentally to all known North American forms, are given under each sectional head below.

The subgenera *Calantica* and *Smilium* should, in my opinion, be elevated to the rank of genera; but as only two species of *Calantica* and none of *Smilium* are described in this paper, I have followed the current generic arrangement. Both groups are more primitive than *Scalpellum*, and *Calantica* was probably ancestral to *Scalpellum* and *Smilium*.

Sections IV and V are mutually more closely related than the others, yet, as they seem to constitute natural phyla and are very numerous in species, I have retained them separate. The rostrum may be either present, vestigeal, or absent in the last four groups.

I. Subgenus CALANTICA Gray.

1825. *Calantica* Gray, Annals of Philosophy, n. ser., X, p. 101, for *S. villosum* Leach.

The capitulum has two whorls of plates, the upper consisting of scuta, terga, and carina, the terga occupying all the space between scuta and carina; lower whorl consisting of three pairs of latera, rostrum, and subcarina. Umbones of all the plates are apical. Complemental males with a distinct capitulum furnished with valves and a peduncle. Type, S. villosum.

The capitulum closely resembles that of *Pollicipes*, yet differs (1) by greater specialization of the armour, there being but a single basal whorl of plates, and (2) by the presence of complemental males, as in *Scalpellum* and *Ibla*, yet these males resemble miniatures of the hermaphrodite form. *Scalpellum* differs from *Calantica* chiefly by the elevation of the lateral plates, which become, as "upper latera," members of the upper whorl of plates, and thereby modify the relative positions and shapes of the terga and scuta. In the typical forms of *Calantica* the median lateral plate can not properly be called an "upper

[a] Section VI, as defined in this key, would include forms of diverse ancestry, but parallel in the one character of reduction of the calcified portions; and in actual practice all such species would have to be given place in a key to the species of this section, though they should be grouped with their real allies. In dealing with parallel phyla it is probably impossible to construct a key for the convenient determination of specimens without using artificial characters.

latus," since it is clearly, by form and position, a member of the lower whorl of plates. It is, however, clearly homologous with the plate which became an upper latus in the more advanced and specialized forms of *Scalpellum.* An intermediate stage is represented by *S. pollicipedoides* Hoek[a] and various other species.

The two species to be described below belong to two rather distinct groups of this subgenus, definable as follows:

I. Section *Calantica s. str.* Plates of the lower whorl low and wide, triangular, small and separated, not concealing the bases of the upper whorl of plates. Scales of the peduncle minute. Plates covered with a distinct cuticle. Western Pacific.

S. villosum Leach, "Eastern Seas."

S. pollicipedoides Hoek, south of New Guinea.

S. trispinosum Hoek, Sulu Sea, 82–102 fathoms.

S. eos Pilsbry, Japan, 71 fathoms.

II. Section *Scillælepas* Seguenza. Plates of the lower whorl well developed, high and recurved, covering the bases of those of the upper whorl. Peduncle very short, covered with scales of moderate size. Plates conspicuously calcareous, not covered with a distinct cuticle. Atlantic and Arctic oceans.[b]

S. calyculus Aurivillius, Azores, 850–900 meters.

S. falcatum Aurivillius, Azores, 454 meters.

S. gemma Aurivillius, Greenland, 1,800 meters.

S. superbum Pilsbry, off S. E. United States, 352–440 fathoms.

S. grimaldi Aurivillius, Azores, 845–1,230 meters.

SCALPELLUM EOS, new species.

Type.—Cat. No. 32877, U.S.N.M.

Type-locality.—*Albatross* Station 3741, off Ose-zaki, Hondo, Japan, in 71 fathoms, on a large *Balanus.*

The capitulum is subtriangular, compressed, the ventral margin nearly straight, with armour of 13 plates, those of the lower whorl very small and inconspicuous; covered with a smooth, yellowish cuticle. The plates are lightly marked with lines of growth and a few weak coarse radial striæ on the ventral half of the scutum. Sutures linear. The umbones of all the plates are apical.

---

[a] See Hoek, Koninklijke Akademie van Wetenschappen te Amsterdam, Proceedings of the section of Sciences, VII, p. 92, figs. 4–6 (Dec., 1904).

[b] The group *Scillælepas* was established by Seguenza in 1872 for Italian and Sicilian miocene and pliocene forms, with the type *S. carinatus* (*Pollicipes carinatus* Philippi). It was correctly recognized as a group intermediate between *Pollicipes* and *Scalpellum.* The earlier species appeared in the Cretaceous. The miocene and pliocene forms are very closely related to modern deep-water species of the Atlantic, and should be carefully compared therewith. Good descriptions and figures of them may be found in G. de Alessandri, Studi Monografici sui Cirripedi fossili d'Italia, in Palaeontographica Italica, XII, 1906, pp. 243, 263.

The scutum is triangular, its basal width more than half the length. The occludent margin is barely convex, the tergal margin straight, the apex erect.

The tergum is long, subtriangular, narrower than the scutum. Its occludent and scutal margins are straight, carinal margin somewhat convex. The apex is erect.

The carina is narrow, very slightly curved, with rounded roof.

The rostrum is triangular, much broader than high, with incurved apex.

The rostral latus is obliquely triangular, broader than high, with incurved apex.

The median lateral plate is triangular, about twice as wide as high.

The carinal latus is obliquely triangular, shaped like the rostral latus, with an incurved apex.

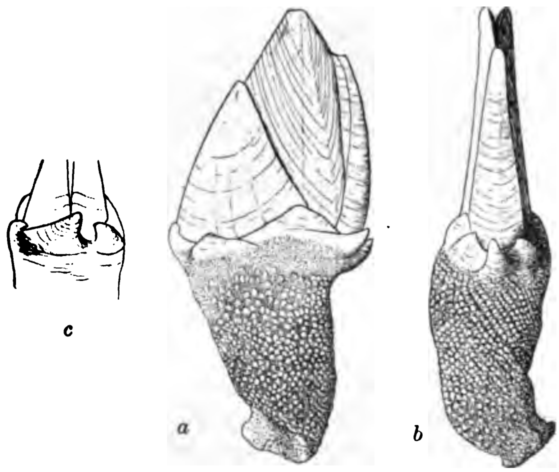


FIG. 2.—SCALPELLUM EOS. *a*, ROSTRAL; *b*, LATERAL; *c*, CARINAL VIEWS OF THE TYPE-SPECIMEN.

The subcarina is triangular, higher than wide.

The peduncle is very large, subcylindric. Its lower half is clothed with very small, convex, rounded, slightly separated scales, higher than wide, and about 0.3 mm. long. These disappear on the upper part of the peduncle, which is nude.

The two cotypes measure as follows:

Length of capitulum 18, width at base 14.5 mm. Length of the peduncle 20 mm. (Fig. 2.)

Length of capitulum 15, width at base 12 mm. Length of the peduncle 13 mm.

This species is related to *S. villosum* Leach, but not very closely. The carina is narrower, the terga erect, not recurved. The scuta are higher and the rostrum is smaller. The cuticle is smooth, not downy as in *S. villosum*.

Scalpellum trispinosum Hoek[a] is somewhat more nearly related to *S. eos*, but differs by the projecting summits of the scuta and carina, the smaller rostral latera, and the shortly villose cuticle.

The rostrum and subcarina seem to be very frequently asymmetrical in the section *Calantica*. In the smaller of the two cotypes of *S. eos* the rostrum is strongly bent toward the right side and the subcarina slightly so. In the larger specimen the subcarina is slightly bent toward the left, the rostrum being symmetrical. Neither of them shows any trace of a subrostrum, such as is developed in *S. villosum*.

SCALPELLUM SUPERBUM, new species.

Type.—Cat. No. 11525, U.S.N.M.

Type-locality.—*Albatross* Station 2669, north latitude 31° 09′, west longitude 79° 33′ 30″, between the Bahamas and Cape Fear, North Carolina, in 352 fathoms, on a branching white coral. Bottom temperature 43.7°.

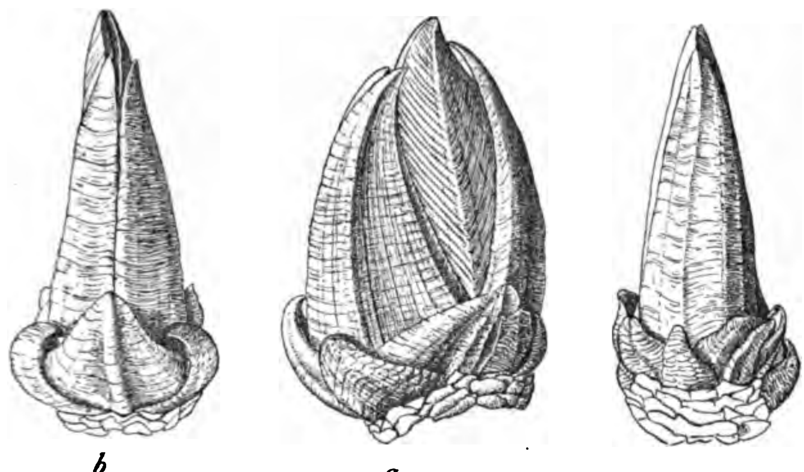


FIG. 3.—SCALPELLUM SUPERBUM. *a*, VENTRAL, *b*, LATERAL, AND *c*, DORSAL VIEWS OF THE TYPE-SPECIMEN. (Nat. size.)

Other localities.—No. 9920, U.S.N.M., Station 2415, north latitude 30° 44′, west longitude 79° 26′, in 440 fathoms, bottom temperature 45.6°, on branching white coral.

The capitulum is somewhat triangular, like that of *S. trispinosum* Hoek, wide and thick at the base, composed of 13 strong white plates, without perceptible cuticle. The plates are sculptured with radiating striæ crossed by growth-lines.

The scutum is pyramidal with recurved apex, and has a strong median ridge from the apex to the middle of the lower margin. Radiating striæ are fine and well developed on the lateral half of the

---

[a] Challenger Report, VIII, Cirripedia, p. 72, pl. VI, figs. 15, 16.

plate. The basal margin is concealed under the lower whorl of plates.

The tergum is in part concealed under the margins of the scuta and carina. The visible part is divided into two equal areas by a prominent median ridge running from apex to base. The summit is erect, only a trifle recurved.

The carina is not much curved, its apex not inserted between the terga. The roof is strongly carinate along the median line, sloping and sculptured with radial striæ on each side of the keel. It is very wide at the base. The sides are narrow and incurved.

The rostrum is triangular, nearly as wide as high, with incurved apex, and having a very strong median longitudinal rib.

The rostral lateral plate is obliquely triangular, with incurved apex. The surface is coarsely sculptured with several very low radial ribs, numerous fine radial striæ, and curved, coarse, low growth-wrinkles. The base of the plate overlies the adjacent bases of the rostrum and inframedian latera. There is no subrostrum.

The median lateral plate is oblique, triangular, much wider than high, with the apex incurved and twisted. A strong flat-topped rib runs from the apex to the basal margin, which in the middle rests directly upon the peduncle.

The carinal latus is oblique, triangular, with the apex curved under those of the inframedian plates. The surface is ribbed.

The subcarina is triangular, usually asymmetrical, with an incurved apex.

The peduncle is very short, and densely covered with large, strongly imbricating white scales.

Length of the capitulum 46, width 34 mm. Length of the visible part of the carina 38, diameter 14 mm. (Fig. 3.)

The plates show some variations in shape in the four specimens taken, the subcarina especially being irregular. It is bent more or less to the right of the median line in two specimens from Station 2669, and to the left in two from Station 2415. In one of those from the latter station the carina and scuta are straightened, the apices projecting, exactly as in *S. trispinosum* Hoek.

Two specimens from Station 2415 measure: Length of capitulum 35, width 28 mm. Length of peduncle 12 mm.

Length of capitulum 28, width 22 mm. Length of peduncle 15 mm.

S. superbum is closely related to *S. gemma* Aurivillius,[a] but it differs by the much longer scuta, which reach almost to the summits of the terga, by the far narrower terga, less recurved at the apices; by the much wider roof of the carina, and finally by the comparatively smaller size of the plates of the lower whorl, and the different

[a] Studien über Cirripeden, in Kongl. Svenska Vetenskaps-Akad. Handlingar, XXVI, 1894, no. 7, p. 41. East coast of Greenland, in 1,800 meters.

shape of the median lateral plates, which are also situated lower. *S. grimaldi* Aurivillius, from the Azores in 845 to 1,230 meters, which has not yet been figured, is probably even nearer our west Atlantic species, but it differs by the straight carina, the shorter subcarina, only a third the length of the rostrum, and by having the apex of the carina intruding a little between the terga. Until a full description and figures are published, the exact relationship of *S. grimaldi* to *S. superbum* can not be determined.

In the figured type of *S. superbum* the upper latus on the side shown is a little abnormal in having an erect apex. It is normally incurved on the other side of the same specimen, as shown on the right side of the dorsal view. The peduncle, too, is broken off short in this example.

II. Subgenus SMILIUM Gray.

1825. *Smilium* GRAY, Annals of Philosophy, new ser., X, p. 100 (*S. peronii* only).

Upper latus occupying the space between scutum and carina, below the tergum; two or three pairs of latera, with rostrum and subcarina forming the lower whorl of plates. Plates 13 or 15. Complemental male having a normal peduncle and capitulum, the latter with plates. Type, S. peronii Gray.

In this group the position of the upper latus and the general structure of the capitulum approximate to the condition in typical *Scalpellum;* but the presence of a subcarina and the primitive *Pollicipes*-like male indicate greater affinity to the subgenus *Calantica*. The known species may be grouped as follows:

a. Valves 13, inframedian latera wanting; male with triangular capitulum and six well-developed valves. *S. peronii* Gray, *S. scorpio* Aurivillius, *S. sexcornutum* Pilsbry.

aa. Valves 15, three pairs of basal latera being present; male more degenerate, with oblong capitulum and three small valves.

- *b.* Carina angularly bent; umbo of scutum not apical. *S. rostratum* Darwin, *S. renei* Gruvel.
- *bb.* Carina bowed, with apical umbo; umbo of scutum apical. *S. squamuliferum* Weltner, *S. stratum* Aurivillius, *S. bengalense* Annandale.

These forms are oriental and austral in distribution, and none are represented in the U. S. National Museum collection.

III. Subgenus SCALPELLUM, s. str.

Valves usually wholly calcified; carina usually angularly bent, with the umbo removed from the apex; inframedian latus wide throughout, the umbo at or below the middle of its height; males sacklike, not divided into capitulum and peduncle, with minute valves or none. Type, S. scalpellum.

This series is chiefly characterized by the broad inframedian latus, with facets of the wide summit against both scutum and upper latus,

and with the umbo at or below the middle, never apical. Besides the species mentioned below, the following seem to belong to this group: *S. calcaratum* Aurivillius, *S. ornatum* Gray, *S. salartiæ* Gruvel, *S. hamatum* Sars.

KEY TO NORTH AMERICAN SPECIES.

a. Umbo of the scutum at its upper third; carina angular near the middle; umbo of the inframedian latus subcentral. Gulf of Mexico..................*S. gibbum.*

aa. Umbo of the scutum near the apex; carina regularly bowed with apical umbo; inframedian latus large, pentagonal, or rounded, with subcentral umbo; profusely hairy. Californian forms.

b. Valves imperfectly calcified at the indistinct edges, the chitinous sutures very wide.......................................*S. californicum.*

bb. Valves strongly calcified, with distinct edges; sutures narrower. *S. osseum.*

aaa. Umbo of the scutum apical, that of the quadrate inframedian latus on its rostral border. North Atlantic and Arctic forms.

b. Width of the inframedian latus less than half its height; rostrum narrow, tapering upward..................................*S. pressum.*

bb. Width of the inframedian latus more than half its height.

c. Umbo of the inframedian latus near the middle of its rostral edge.

d. Rostrum narrow ....*S. stroemii.*

dd. Rostrum wide, triangular..........*S. stroemii latirostrum.*

cc. Umbo of the inframedian latus near the rostro-basal angle of the plate ....*S. stroemii substroemii.*

This section comprises several subsidiary phyla, and the group of *S. stroemii* could with some reason be removed to form a separate section, characterized by the high rostral latera of the female and hermaphrodite forms and the more degenerate complemental males, which have been investigated in *S. stroemii* and *S. nymphocola* by Hoek.

In *S. patagonicum* and *S. inerme* there has been reduction of the calcareous portions of the valves, the general structure not being much altered otherwise.

GROUP OF SCALPELLUM SCALPELLUM.

SCALPELLUM STEARNSII Pilsbry.

1890. *Scalpellum stearnsii* Pilsbry, The Nautilus, IV, p. 96 (December, 1890); Proc. Acad. Nat. Sci. Phila., 1890, p. 441 (Feb. 3, 1891).—Gruvel, Monographie des Cirrhipèdes, 1905, p. 44.

Localities.—Cat. No. 32873, U.S.N.M., east coast of Japan between the bay of Tokyo and the Inland Sea, F. Stearns, one of the original lot, dry. No. 32874, Japan, collector unknown, dry. No. 22152, Japan, H. Loomis, dry. No. 32875, *Albatross* Station 3704, Seno Umi, off Hondo Island, Japan, 94 fathoms.

Two of the four specimens in the collection surpass the type of the species in size, measuring as follows:

No. 32873, a dry specimen: Length of capitulum 52, breadth 36 mm; length of peduncle 35 mm; length of carina 53, diameter at base 7 mm. No. 32875, an alcoholic specimen; length of capitulum 50, breadth 34 mm; length of peduncle 58 mm; length of carina 49, diameter at base 8 mm.

In the dry examples the peduncle is much shortened and the scales become crowded. In the alcoholic individual taken by the *Albatross* the peduncle is longer than the capitulum, and the scales are seen to be arranged in circular whorls separated by chitinous nude intervals. There are 15 such whorls, not counting some much smaller, irregularly placed scales at the base of attachment, each whorl being composed of about 17 scales. These are placed obliquely, the upper and ventral end of each scale imbricating over the lower and dorsal end of the following scale.

The capitulum and peduncle are covered with a gray cuticle, which is distinctly velvety to the touch. This was not apparent in the dry examples, and hence was not noticed in the original description.

In No. 32875 the carina is more robust, with the umbo removed a little more from the summit of the plate than in the type lot. Moreover, the carina reaches farther up toward the apex of the tergum, its end being at the upper fourth of the carinal margin of the tergum, while in the type lot it is but little beyond the upper third.

An alcoholic example taken by the Fisheries steamer *Albatross* gives opportunity to examine the mouth parts and cirri.

The mandible (Plate IV, fig. 4) has six larger teeth, counting the blunt lower point, and two smaller ones. The lower point is covered with minute spines.

The maxilla (Plate IV, fig. 5) has a sinuous edge, closely set with spines. There is a tuft of delicate hairs on the upper border.

The first pair of cirri (Plate IV, fig. 1) has very unequal rami, the anterior ramus shorter, with 12 segments greatly produced on their lateral borders. The posterior ramus consists of about 16 segments. The spines are chiefly seated on the distal borders of the segments. The inner face of the cirrus is very densely spinose all over.

The second pair of cirri is shorter than those following, with the endopod a trifle longer than the outer ramus. Externally they show a row of large spines along the anterior border, about five or six on each of the lower segments, the number decreasing to one on the distal ones. There are also groups of smaller spines at the sutures, along the posterior margins. The whole inner face of the cirrus is densely hairy.

On the sixth cirrus, along the anterior side of each ramus, there is a double series of long diverging spines, five spines on each joint. Between each pair of large spines there is a group of small ones.

Near the ends of the cirri the spines decrease in number, so that finally there are only one or two pairs on each joint. Near the base the joints are much shorter than in the middle, and bear four pairs of shorter spines. At the posterior margin of the cirrus, a small group of two to four short spines springs from the distal end of each joint. Plate IV, fig. 3, shows the arrangement of spines on a middle joint of the sixth cirrus. The outer and inner faces of the cirri are alike, the latter not hairy, and the two rami are of nearly the same length, composed of about 45 joints.

The terminal appendage (Plate IV, fig. 2) is very small, only about 2 mm. long, and composed of six joints. It terminates in a few long bristles.

Scalpellum inerme Annandale,[a] from Bali Straits, 160 fathoms, is clearly a derivative from the *S. stearnsii* stock, divergent in the degeneration of the valves. The broad joints of the anterior branch of the first cirrus resemble those of *S. stearnsii*, but according to Annandale's figure, there are fewer joints. The caudal appendages are decidedly more developed in *S. inerme*. The mandible has numerous teeth, as in *S. stearnsii*.

SCALPELLUM SCALPELLUM (Linnæus).

1767. *Lepas scalpellum* LINNÆUS, Systema naturæ, 12th ed., p. 1109.
1824. *Scalpellum vulgare* LEACH and of authors.

Localities.—Cat. No. 12186, 32873, Shetland Islands, Jeffreys collection. No. 12173, Unst, Shetland Islands, 85 fathoms, Jeffreys collection. No. 12181, Swansea Bay, Wales, Jeffreys collection. No. 12174, Plymouth (Bate), Jeffreys collection. No. 12175, Exmouth Beach, Jeffreys collection. No. 12171, 150 miles from Land's End, 200 fathoms (Sir John Anderson), Jeffreys collection. No. 23188, Naples, zoological station.

There are also several lots without locality data, but all apparently British. The series comprises some hundreds of examples, and was brought together by J. Gwyn Jeffreys, the well-known conchologist. The use of the specific name *vulgare* by Leach, Darwin, and later authors, was in order to avoid tautonomy, but changes on this account are now considered inadmissible, and I therefore revert to the Linnean name.

Abundant as this species is in the seas of northern Europe, it has not been found on the American side.

---

[a] Annandale, Malaysian Barnacles in the Indian Museum, Mem. Asiatic Soc. of Bengal, I, No. 5, p. 75, 1905, pl. VIII, figs. 1, 1*a*.

SCALPELLUM GIBBUM, new species.

Type.—Cat. No. 10060, U. S. N. M.

Type-locality.—*Albatross* Station 2388. Gulf of Mexico. North latitude 29° 24′ 30″, west longitude 88° 01′, 35 fathoms.

The capitulum is subtriangular, the ventral margin straight, the dorsal (carinal) margin angularly bent in the middle; composed of 14 fully calcified plates, separated by rather narrow chitinous sutures; covered with a thin, rather sparsely hairy cuticle. The plates are very lightly marked with growth lines.

The scutum is more than twice as long as wide, with the umbo slightly prominent, at the upper third of the occludent margin. The tergal margin is very oblique; the lateral margin is angular below its middle, the basal margin slightly concave.

The tergum is very much longer than the scutum, narrowly triangular. The occludent margin is slightly convex, becoming abruptly and very strongly recurved at the summit. The scutal margin is nearly straight. The carinal margin is composed of two concave curves, a very short one above the summit of the carina and a much longer curve below it.

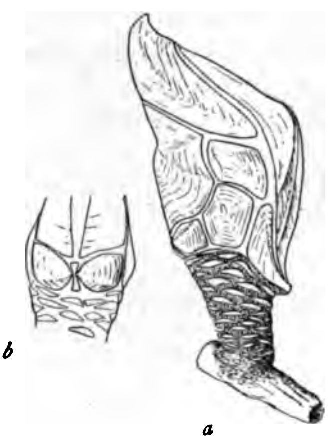


FIG. 4.—SCALPELLUM GIBBUM. *a*, LATERAL VIEW × 4½; *b*, DETAIL OF ROSTRUM.

The carina is very prominently angular near the middle, the dorsal outline straight above the angle, a little convex below it. The roof is convex, but bounded by low lateral ribs, accompanied at a little distance by a second arcuate rib on each side. The sides are wide and flat, marked with four or five wrinkles parallel to lines of growth. The umbo is close above the dorsal angle of the valve. The upper end of the carina is above the upper third of the carinal margin of the tergum.

The upper latus is rhomboidal, the scutal and carinal margins convex, the tergal margin straight, and the basal margin concave. The umbo lies near the scutal margin, about midway between the basal and tergal borders.

The rostrum is narrow, parallel-sided, the beaks of the rostral latera meeting over it above the middle. The rostral latus is shaped like the brachiopod *Lingula;* twice as long as high. Umbo acute. Upper and basal margins are parallel, the lateral margin straight.

The inframedian latus is convex, pentagonal, very much larger than the other plates of the lower whorl, and fully equal to the upper latus in area. Its basal and rostral margins are shorter than the others,

and about equal. The scutal, upper, and carinal borders are successively longer, the latter nearly twice as long as the rostral. The umbo is nearly central.

The carinal latus is claw-shaped, the umbo projecting below the carina. The basal and lateral margins are about equal, the upper margin very short, the carinal margin concave, with a low, submarginal rib.

The peduncle is covered with large imbricating scales, in about 10 rows.

Length of the capitulum 7, breadth 4 mm. Length of the peduncle 2 mm. (Fig. 4.)

This very distinct little barnacle is related to *S. scalpellum*, yet differs in many respects. The capitulum is strongly contracted toward the base, while in *S. scalpellum* the dorsal and ventral margins are nearly parallel there. The inframedian latus is larger in *S. gibbum*, with a subcentral, instead of subbasal, mucro. The carinal latus is comparatively longer and narrower than in *S. scalpellum*, and the rostrum is narrower. Finally, the carina is more strongly sculptured than in *S. scalpellum*.

S. gibberum Aurivillius, from off the Rio de La Plata, differs by its smaller rostrum, basal umbo of the inframedian lateral plate and other characters.

SCALPELLUM PATAGONICUM Gruvel.

1900. *S. patagonicum* GRUVEL, Bull. du Mus. d'hist. nat. Paris, 1900, p. 188; Archives du Muséum, 4ᵉ sér., IV, 1902, p. 236, pl. XII, fig. 1A, 16 (coast of Patagonia).

Localities.—Cat. No. 32918, U.S.N.M., Straits of Magellan, *Albatross* Station 2775, in 29.5 fathoms, seated mainly on *Mytilus* shells. Station 2776, south latitude 52° 41′, west longitude 69° 55′ 30″, in 21 fathoms. Station 2773, south latitude 52° 23′, west longitude 68° 11′, in 10 fathoms. No. 32917, U.S.N.M., off the east coast of Patagonia. Station 2767, south latitude 48° 03′, west longitude 58° 56′, in 52 fathoms. Station 2758, south latitude 42° 24′, west longitude 61° 38′ 30″, off the Bay of San Matias, Patagonia.

Abundant series were taken at Stations 2775 and 2767. In the young and half-grown individuals the chitinous spaces between the plates are much reduced, such examples then resembling *S. scalpellum* (Linnæus). At Station 2775 the typical form occurs, with the capitulum 10 to 12 mm. long, and the umbo of the inframedian lateral plate more or less protuberant. Similar individuals were taken at Stations 2776 and 2773. The largest from the latter station measure 16 mm. long.

At Station 2767, off the east coast of Patagonia, they grow larger, the capitulum reaching a length of 18 to 20, peduncle 16 to 20 mm. long, and the umbo of the inframedian lateral is usually flattened. A single individual from Station 2758, farther north, has the umbo similarly flattened.

S. patagonicum is remarkable for the imperfect calcification of the valves in the adult stage. In other respects it resembles *S. scalpellum*.

GROUP OF SCALPELLUM CALIFORNICUM.

SCALPELLUM CALIFORNICUM Pilsbry.

1907. *Scalpellum californicum* PILSBRY, Bulletin of the Bureau of Fisheries, XXVI, p. 196, pl. VI, figs. 8, 13.

Type.—Cat. No. 32811, U.S.N.M.

Locality.—Vicinity of Monterey Bay, California, in 40 to 86 fathoms.

SCALPELLUM OSSEUM Pilsbry.

1907. *Scalpellum californicum osseum* PILSBRY, Bulletin of the Bureau of Fisheries, XXVI, p. 196, pl. VI, fig. 7.

Type.—Cat. No. 32413, U.S.N.M.

Type-locality.—*Albatross* Station 4454, off Point Pinos Light, 71 fathoms.

Other localities.—No. 32910, U.S.N.M., *Albatross* Station 2906, off southern California, north latitude 34° 23′ 30″, west longitude 120° 19′ 30″, in 96 fathoms, bottom temperature 55.5°.

The capitulum is oblong-rhombic, with the occludent border straight or nearly so; dorsal border moderately convex; upper border oblique and a little concave. It is composed of 14 fully calcified valves, joined by narrow sutures, covered with a thin cuticle, sparsely hairy on the sides, more profusely so dorsally. The valves are weakly sculptured with widely spaced wrinkles along lines of growth.

The scutum is half the total length of the capitulum, and fully twice as long as wide, with parallel occludent and lateral margins and acute, erect, apex, which does not project from the occludent outline. The umbo is removed a short distance from the apex. The basal margin is oblique and straight. The occludent half of the plate shows some very inconspicuous radial striæ.

The tergum is triangular, nearly 1½ times the length of the scuta. The occludent and scutal margins are straight, the carinal margin a little irregular or convex; apex erect.

The carina is weakly curved, with apical umbo. The roof is convex, quite wide toward the base, and bounded by low ribs. The sides are well developed, divided into two areas by a low curved riblet which defines the division into intraparietal and parietal portions.

The upper lateral plate is subrhombic, the scutal and tergal margins straight and about equal, the basal margin decidedly shorter, the baso-carinal extremity rounded. The umbo is not quite terminal.

The rostrum is small but well developed, in shape an isosceles triangle. The rostral latus is transversely elongate, about twice as long as wide, a little narrower ventrally, and divided by a low rib from the apex to the baso-lateral angle. The inframedian latus is pentagonal, a little longer than wide, with the umbo at the upper rostral third.

The carinal latus is irregularly triangular, higher than wide, with the umbo at the lower fourth, at the baso-lateral angle of the carina.

The peduncle has about 19 rows of about 13 scales each. It is hirsute like the capitulum, and varies a good deal in length.

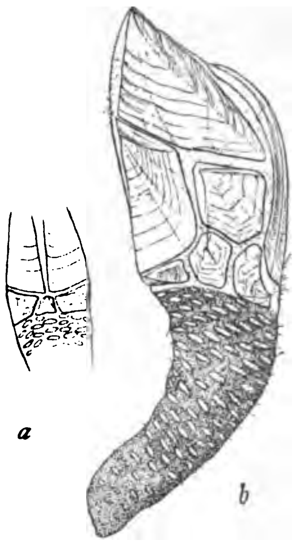


FIG. 5.—SCALPELLUM OSSEUM. *a*, LATERAL VIEW × 3; *b*, DETAIL OF ROSTRUM.

Length of the capitulum 12.5, breadth 7 mm. Length of the peduncle 10 mm. Length of the carina 10, diameter at base 1.6 mm. (Fig. 5.)

The figure and description are from one of a group of six individuals from Station 2906, most of them with the peduncle much shorter—6 or 7 mm. long. When I described this form as a subspecies of *S. californicum* I had only some young individuals less than half the size of those now before me. The larger examples show that with increased size the valves remain strongly calcified to their borders, differing from *S. californicum* of equal size, in which the valves are but weakly calcified, their edges chitinous. These constant differences in the considerable series of both forms now before me seem to indicate that *S. osseum* is a distinct species, though closely related to *S. californicum*. A full description of the adult form of *S. osseum* is given above to supplement my former account of the young stage.

The two species, *californicum* and *osseum*, are related to the group of *S. scalpellum* rather than to that of *S. stroemii*, having the characteristic low rostral latera and short rostrum of the former group.

GROUP OF SCALPELLUM STROEMII.

S. stroemii is the senior name of a series of small North Atlantic and Arctic forms, distinguished by the large pentagonal inframedian latus with the umbo at or below the middle of its rostral border, a long and narrow or triangular but well-developed rostrum, the rostral latus about as high as wide, subtriangular or quadrangu-

lar, and generally the umbo of the carina is removed more or less from the apex. The named forms are as follows:

S. stroemii M. Sars.
S. obesum Aurivillius.
S. luridum Aurivillius.
S. aduncum Aurivillius.
S. grœnlandicum Aurivillius.
S. cornutum Sars.
S. angustum G. O. Sars.
S. nymphocola Hoek.
S. septentrionale Aurivillius.

Of these forms, *S. angustum* and *S. nymphocola* are distinct by the quite apical umbo of the carina and the acute terga. *S. cornutum* differs from the others by the position of the umbo of the inframedian latus, among other features. In *S. grœnlandicum* the umbo of the carina, while not quite terminal, does not project, and the rostrum is wider above than below.

All of the other forms (*S. stroemii* Sars, *septentrionale*, *obesum*, *luridum*, and *aduncum* Aurivillius) have the carina angular, the rostrum tapering upward, and the umbo of the inframedian latus at or below the middle of the rostral margin. It seems to me very doubtful whether the several forms of this type can be distinguished as species. Their slight differences are apparently due in part to age, but chiefly represent, I think, local and colonial variations of *S. stroemii*,[a] a species in which nearly every colony brought up by the dredge has its own slight peculiarities.

The degree to which the basal whorl of plates is swollen varies with age. Figures 1 to 5 on Plate I represent three individuals from one cluster, drawn to the same scale, and selected from a continuous series of variations in obesity, to illustrate this point, the old, obese examples having ovaries swollen with eggs.

SCALPELLUM STROEMII M. Sars.

Plate I, figs. 6, 7 (typical), and figs. 1–5 (variety).

1859. *S. stroemii* M. Sars, Forhandlinger Videnskabs-Selskabet i Christiania, Aar 1858, p. 158, (Finmark, 40–50 fms.).

1891. *S. stroemii* G. O. Sars, Forh. Videnskabs-Selsk. Aar 1890, p. 77.

This species has been variously identified by Verrill, Hoek, and Gruvel. On application to Prof. G. O. Sars I received two specimens,

[a] Hoek's figure of *S. stroemii* (Challenger Report, Cirripedia, pl. III, fig. 6) is evidently erroneous in the shading of the inframedian and upper latera, giving the impression that these plates have subcentral umbones; also in the position of the umbo of the scutum. The upper latus is figured as nearly three times as long as wide, a proportion unlike any form of the group known to me. The specimen requires reexamination.

The carina is moderately arcuate, with the umbo projecting a little, near the apex. The roof is convex, and shows a few weak longitudinal striæ at the sides. The sides (parietes) are rather narrow; the intraparietes are somewhat wider.

The upper lateral plate is larger than in related species, pentagonal. The carinal and two lower facets are subequal. The scutal margin is about twice as long as the basal, and the tergal margin is slightly longer than the scutal. The umbo is not quite terminal.

The rostrum is very long, narrowly wedge-shaped, slightly enlarged at the projecting apex.

The rostral latus is triangular, a trifle longer than wide. The rostral margin is slightly convex, the lateral margin slightly sinuous, the scutal margin somewhat concave.

The inframedian latus is more than twice as high as wide, with the umbo on the rostral margin below the middle. The scutal margin is slightly shorter than that against the upper latus. The carinal margin is nearly straight.

The carinal lateral plate is about twice as high as wide. The umbo projects slightly behind the base of the carina. Below it there is a nearly straight margin almost as long as the basal margin and about one-third the length of the plate. The upper margin is oblique. The dorsal margins of the two carinal latera meet below the umbones in a straight suture.

The peduncle is about one-third to one-half the length of the capitulum. It tapers to the base and is covered with 8 rows of rather large imbricating scales, 8 to 10 scales in a row.

Length of the capitulum 8, breadth 4, greatest diameter 1.8 mm. Length of the peduncle 3 mm.

This species, which seems to be somewhat abundant off our northeastern coast, resembles the form which Aurivillius has called *S. septentrionale*. It differs from that, however, by the narrower base of the capitulum, the greater compression, and the position of the umbo of the carina, which is much nearer the apex. The inframedian lateral plate is longer than in any of the related forms, and the rostrum has the long and narrow shape figured by Aurivillius for *S. septentrionale* and *S. obesum*. The capitulum of *S. pressum* is more lengthened than that of *S. stroemii*, chiefly by reason of the elongation of the plates of the lower whorl.

Besides the lots mentioned above, there are several others without exact localities, donated by Gloucester fishermen. This barnacle is often seated on the egg capsules of rays or sharks. (Fig. 6.)

SCALPELLUM STROEMII LATIROSTRUM, new subspecies.

Plate I, figs. 11, 12, 13, 14.

Type.—No. 10780, U.S.N.M.

Type-locality.—*Albatross* Station 2527, north latitude 41° 59′, west longitude 65° 35′ 30″, southeast border of Georges Bank, in 117 fathoms.

The rostrum is triangular, much broader at the base than in any other known form of the *stroemii* group. Rostral latera about as in *S. stroemii.* Inframedian lateral plate generally short and wide, with the umbo at the lower third or slightly below the middle of the rostral margin. Roof of the carina flattened, with more or less distinct bordering ribs. Length of capitulum 11, width 6, diam. 4 mm.

This form has the capitulum swollen laterally at the lower whorl of plates, and is distinguished by the very wide rostral plate.

Plate I, figs. 15, 16, represent a form somewhat intermediate between *latirostrum* and *substroemii* in the shape of the rostrum. The figures are drawn from No. 9020, U.S.N.M.

SCALPELLUM PRESSUM, new species.

Type.—No. 32903, U.S.N.M.

Type-locality.—Le Have Bank, 300 fathoms, Captain Johnson donor.

Other localities.—Nos. 9027, 9024, U. S. Fish Commission, Station 1124, off Marthas Vineyard. No. 32904, *Albatross* Station 2668, north latitude 30° 58′ 30″, west longitude 79° 38′ 30″, off Fernandina, Florida, 294 fathoms. No. 10778, *Albatross* Station 2470, off Nova Scotia, 224 fathoms. No. 32905, *Albatross* Station 2527, off Georges Bank.

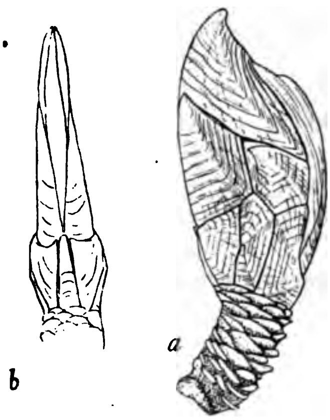


FIG. 6.—SCALPELLUM PRESSUM. *a*, VENTRAL VIEW; *b*, LATERAL VIEW. × 5.

The capitulum is compressed, widest above the middle, tapering toward the base which is quite narrow; composed of 14 plates, which are irregularly marked with concentric wrinkles and a few weak radial striæ. The occludent border is convex, chiefly so in its upper half.

The scutum is about twice as long as wide, the occludent border but slightly convex. The oblique basal margin is a little shorter than the lateral.

The tergum has a convex occludent margin. The apex is recurved. The carinal margin is a little concave above the carina, straight where in contact with it.

The carina is moderately arcuate, with the umbo projecting a little, near the apex. The roof is convex, and shows a few weak longitudinal striæ at the sides. The sides (parietes) are rather narrow; the intraparietes are somewhat wider.

The upper lateral plate is larger than in related species, pentagonal. The carinal and two lower facets are subequal. The scutal margin is about twice as long as the basal, and the tergal margin is slightly longer than the scutal. The umbo is not quite terminal.

The rostrum is very long, narrowly wedge-shaped, slightly enlarged at the projecting apex.

The rostral latus is triangular, a trifle longer than wide. The rostral margin is slightly convex, the lateral margin slightly sinuous, the scutal margin somewhat concave.

The inframedian latus is more than twice as high as wide, with the umbo on the rostral margin below the middle. The scutal margin is slightly shorter than that against the upper latus. The carinal margin is nearly straight.

The carinal lateral plate is about twice as high as wide. The umbo projects slightly behind the base of the carina. Below it there is a nearly straight margin almost as long as the basal margin and about one-third the length of the plate. The upper margin is oblique. The dorsal margins of the two carinal latera meet below the umbones in a straight suture.

The peduncle is about one-third to one-half the length of the capitulum. It tapers to the base and is covered with 8 rows of rather large imbricating scales, 8 to 10 scales in a row.

Length of the capitulum 8, breadth 4, greatest diameter 1.8 mm. Length of the peduncle 3 mm.

This species, which seems to be somewhat abundant off our northeastern coast, resembles the form which Aurivillius has called *S. septentrionale*. It differs from that, however, by the narrower base of the capitulum, the greater compression, and the position of the umbo of the carina, which is much nearer the apex. The inframedian lateral plate is longer than in any of the related forms, and the rostrum has the long and narrow shape figured by Aurivillius for *S. septentrionale* and *S. obesum*. The capitulum of *S. pressum* is more lengthened than that of *S. stroemii*, chiefly by reason of the elongation of the plates of the lower whorl.

Besides the lots mentioned above, there are several others without exact localities, donated by Gloucester fishermen. This barnacle is often seated on the egg capsules of rays or sharks. (Fig. 6.)

SCALPELLUM ANGUSTUM Sars.

Locality.—Cat. No. 17266, U.S.N.M. Kara Sea. Dijmphna expedition 1882–83.

Distinct from *S. pressum* by the terminal umbo of the carina, the higher position of the umbo of the carinal lateral plate, and the parallel-sided rostrum. The tergum in these specimens does not project so far upward as in Gruvel's figures.

Section IV. HOLOSCALPELLUM, new section..

Rostral latus wide and low, its width usually double the height, with long subparallel basal and scutal borders; inframedian latus smaller than the rostral latus; rostrum small or wanting; carina with the umbo apical or near the apex; plates 13 or 14. Type, S. velutinum.

A large natural group of almost exclusively deep-sea species, widely distributed in both Atlantic and Pacific waters. Besides the species considered below, the following belong here: *S. darwini*, *S. gigas*, *S. moluccanum*, *S. rubrum*, *S. antarcticum*, *S. hirsutum*, *S. indicum*, *S. pedunculatum*, *S. sociabile*, *S. alcockianum*, and probably some others.

The complemental males are sack-like, with no division into capitulum and peduncle, and have excessively minute valves or none.

KEY TO SPECIES.

a. Carinal latus much wider than high; umbo recurved, near the upper margin. Species of large size.
  b. Plates in contact; carina very broad at base, breadth ¼ to ⅓ the length, roof flat or concave between raised lateral borders .... *S. velutinum.*
  bb. Plates separated by wide chitinous sutures.
    c. Carina rounded dorsally; valves covered with a thick cuticle; umbo of carinal latus not projecting .... *S. giganteum.*
    cc. Carina with flattened roof bounded by angles, and narrow throughout; umbo of carinal latus projecting laterally .... *S. regina.*
aa. Carinal latus about as high as wide, the umbo apical; inframedian latus wider than high. Large species.
  b. Roof of the carina slightly convex, angular at the sides .... *S. regium.*
  bb. Roof flat with bordering ribs; inframedian latus larger... *S. regium latidorsum.*
aa. Carinal latus about as high as wide, the umbo projecting directly backward beyond the carina; inframedian latus narrow, hooked forward; umbo of carina at the middle of carinal margin of tergum. Small, violet-tinted. *S. gorgoniophilum.*
aaaa. Carinal latus about as high as wide, the umbo recurved, at or below the middle of its carinal border. Small species.
  b. Inframedian latus narrow and high, oblong or tapering upward, without conspicuously produced angles.
    c. Upper end of inframedian latus rather acute. Atlantic.
      d. Capitulum not tapering toward the base; apex of inframedian latus curved toward the scutum.
        e. Umbo of carinal latus about median on the carinal border. *S. portoricanum intonsum.*

ee. Umbo of carinal latus at the lower third of the carinal border. *S. portoricanum.*

dd. Capitulum widest in the middle, tapering to the base; inframedian latus erect..*S. longicarinatum.*

cc. Upper end of the inframedian latus obtuse or truncate. Pacific species.

d. Rostrum present ....*S. sanctipetrense.*

dd. Rostrum wanting.

e. Plates fully calcified; umbo of inframedian latus subapical. *S. gruvelianum.*

ee. Plates separated by wide chitinous sutures; umbo of inframedian latus submedian...................................*S. gruvelianum secundum.*

bb. Inframedian latus of very irregular shape, its upper carinal angle produced; roof of carina deeply guttered.

c. Scales of the peduncle minute, 0.2 to 0.3 mm. wide; scutum and upper latus radially striate; carina narrow. East coast of Patagonia......*S. rathbunæ.*

cc. Scales of the peduncle about 1 mm. wide; scutum and upper latus not radially striate; carina wider. Galapagos..............................*S. soror.*

aaaa. Carinal latus subtriangular, its narrower umbonal half free, projecting downward below the carina, umbo terminal.

b. Carina with wide intraparietes, the umbo not apical; inframedian latus oblong-pentagonal, the umbo not apical. Gulf of Mexico...............*S. arietinum.*

bb. Carina with narrow sides throughout, the umbo terminal; inframedian latus triangular, with the apex curved toward the scutum, umbo apical. *S. diceratum.*

GROUP OF SCALPELLUM VELUTINUM.

The carinal latus has a recurved umbo, either apical or near the upper border of the plate; the triangular inframedian latus is wider than high; the capitulum is more or less thickly clothed with a velvety cuticle. Large or very large forms.

This group comprises most of the largest species of the genus known.

SCALPELLUM VELUTINUM Hoek.

Plate III, fig. 2, 3.

1883. *Scalpellum velutinum* Hoek, Challenger Rep., Cirripedia, p. 96, pl. iv, figs. 10, 11. Off Cape St. Vincent, 900 fathoms, and off Tristan da Cunha 1,425 fathoms.—Gruvel, Expéd. Sci. du Travailleur et du Talisman, Cirrhipèdes, 1902, pp. 56, 136, pl. iii, fig. 1; pl. xi, fig. 3c. Off Cape Cantin, Cape Mogador, Fuereventure and Pilones, in 882 to 2,000 meters.

1883. *Scalpellum eximium* Hoek, Challenger Rep., Cirripedia, p. 100, pl. iv, figs. 6, 7. Off Tristan da Cunha, 1,000 fathoms.

1898. *Scalpellum sordidum* Aurivillius, Bull. Soc. Zool. de France, XXIII, p. 190.

1902. *Scalpellum alatum* Gruvel, in Expéd. Sci. du Travailleur et du Talisman, Cirrhipèdes, p. 57.

Localities in the western Atlantic.

Museum No.	Station No.	Locality. North latitude.			Locality. West longitude.			Depth.	Collector, etc.
		°	′	″	°	′	″	*Fathoms.*	
3765	....	43	34	00	49	00	00	....	Capt. F. F. Hodgdon.
10766	2429	42	55	30	50	51	00	471	*Albatross.* Off Newfoundland.
12480	....	42	48	00	63	07	00	35	Capt. Jos. W. Collins, 1878.
3174	....	42	44	00	65	54	00	350–400	Unknown.
4107	....	42	40	00	63	06	00	....	Capt. Jerome McDonald.
4108 8969	....	Le Have Bank.						160	Capt. Daniel McKinnon.
10757 10760	2528	41	47	00	65	67	30	677	*Albatross.* Bottom temperature, 38.7°.
9025	1122	40	02	00	68	50	00	351	U. S. F. C. Off Marthas Vineyard.
9056	1124	40	01	00	68	54	00	640	Do.
10759	2554	39	48	30	70	40	30	445	*Albatross.* Bottom temperature, 39.6°.
9010 32896	2205	39	35	00	71	18	45	1,078	*Albatross.* Bottom temperature, 38.1°.
9037	2231	38	29	00	73	09	00	965	*Albatross.* Bottom temperature, 36.8°.
12892	2742	37	46	30	73	56	30	865	*Albatross,* Bottom temperature, 38°,
12890	2739	37	34	30	73	58	00	811	*Albatross.* Bottom temperature, 38.2°.
12283	2731	36	45	00	74	30	00	781	*Albatross.*
12285	2730	36	42	00	74	30	00	727	Do.
11532	2678	32	40	00	76	40	30	731	Do.

This magnificent species may be recognized by the characteristic shape of the carina, which has a flat roof with bordering flanges and a squarely truncate base, not triangularly entering between the carinal latera, as in the allied large species. The roof is much wider basally than in other related species, its width there varying from one-fourth to over a third of the whole length of the carina.

The largest individual before me measures: Length of capitulum 56, breadth 38 mm.; length of peduncle 36 mm., carina 50 mm. long, with a basal diameter of 18 mm. It is from the Great Banks of Newfoundland.

The group figured is part of No. 12480, U.S.N.M., taken on the fishing banks in 35 fathoms.

S. velutinum has a wide range on both sides of the Atlantic. It was taken by the *Challenger* at two stations near Tristan da Cunha, but all other records are from north of the equator. It seems to extend farther north on the American than on the European side. In our waters it has been found from about the latitude of Charleston, South Carolina, to above that of Boston, 32° 40′ to 43° 34′ north latitude, in depths of from 35 to over 1,000 fathoms, the bottom temperature ranging from 36.8° to 39.6°. It is common on the fishing banks, and is frequently brought up on the lines of the Gloucester fishermen.

S. velutinum has been reported by Dr. Annandale from the Gulf of Oman, in 430 fathoms. *Scalpellum formæ* Alessandri, of the Italian miocene, is closely related to *S. velutinum.*

SCALPELLUM REGIUM Wyville Thomson.

Plate III, figs. 4, 5.

1877. *Scalpellum regium* WYVILLE THOMSON, The Voyage of the Challenger. The Atlantic, II, p. 4, fig. 2 (♀) and p. 7, fig. 3 (♂)—HOEK, Challenger Report, VIII, Cirripedia, p. 106, pl. IV, figs. 3–5 (type-locality, north latitude 34° 54′, west longitude 56° 38′, 2,850 fathoms; also 35° 29′, 50° 53′, 2,750 fathoms).

Locality.—Cat. No. 8629, U.S.N.M., *Albatross* Station 2226, east of the mouth of Chesapeake Bay, north latitude 37°, west longitude 71° 54′, 2,045 fathoms, Globigerina ooze. Seated on a slender gorgonian stem and on a pebble.

This is the first record of this species in the west Atlantic.

The specimens on a gorgonian stem (Plate III, fig. 4) have a thin, smooth cuticle, nowhere visibly hairy, though velvety to the touch, and the plates of the basal whorl are somewhat higher than in the figured type of *S. regium.* Plate II, fig. 8, represents a transverse section of the carina. Length of capitulum 39; of peduncle 20 mm. The rostrum is lanceolate-linear, extending up between the umbones of the rostral latera.

Another specimen, attached to a pebble (Plate III, fig. 5), is covered with a densely pilose cuticle, the pile longer on the peduncle. The plates are as figured for typical *S. regium.* The two carinal latera are in contact only near the base, for a space of 2.5 mm., while in the other specimen they are in contact for 7 mm. The rostrum is narrowly lanceolate, the rostral latera meeting above it. Length of capitulum 35; of peduncle 23 mm.

The cirri of one of the examples from Station 2226 agree in essential respects with Hoek's description. The branches of the first pair have 8 and 12 segments, those of the anterior ramus being produced laterally. Cirrus ii has 26 segments in each ramus. The other cirri are longer and equal. The caudal appendage (Plate IV, fig. 8) consists of 6 segments, spiny at the articulations, terminating in a pencil of long spines. The penis is very long, and its distal half is quite slender. In Hoek's example there were 4 segments in the caudal appendage, and no penis.

The mandible (Plate IV, figs. 6, 7) has four teeth, including the lower angle. The space between the upper and second teeth is double that separating the other teeth. The basal tooth or angle is shortly and closely spinose at the edge (fig. 7). The maxilla has a single large spine at the upper angle, the rest of the face being evenly spinose. The edge recedes a little under the large spine. The upper border is shortly hairy.

Three quite young examples are before me, clearly referable to *S. regium* or perhaps to the following subspecies, the smallest with the capitulum 8, the largest 10 mm. long. The inframedian latus is narrower and higher than in adult *regium*, with the apex curved

toward the ventral border. The rostrum is decidedly better developed than in adults. It is oblong and parallel-sided, with truncate apex in the larger examples, but is wider near the apex and tapers downward in the smallest specimen. The scutum is somewhat narrower than in adult *regium*. These young specimens are from the following stations:

Cat. No. 10782, *Albatross* Station 2575, north latitude 41° 07′, west longitude 65° 26′ 30″, in 1,710 fathoms; temperature, 37.1° F. No. 10781, *Albatross* Station 2533, north latitude 40° 16′ 30″, west longitude 67° 26′ 15″, in 828 fathoms; temperature, 38.7° F. No. 8637, *Albatross* Station 2228, north latitude 37° 25′, west longitude 73° 06′, in 1,582 fathoms; temperature, 36.8° F.

SCALPELLUM REGIUM LATIDORSUM, new subspecies.

Plate II, figs. 2, 3, 7. Plate IV, figs. 10, 11, 12, 14.

Type.—Cat. No. 8632, U.S.N.M.

Type-locality.—*Albatross* Station 2222, north latitude 39° 03′, west longitude 70° 51′, 1,537 fathoms.

Other localities.—No. 9058, Station 2042, north latitude 39° 33′, west longitude 68° 27′, 1,555 fathoms. No. 9057, Station 2041, north latitude 39° 23′, west longitude 68° 25′, 1,608 fathoms. Station 2210, north latitude 39° 37′ 45″, west longitude 71° 18′ 45″, 991 fathoms.

The capitulum resembles that of *S. regium* in shape and the general arrangement of the plates. It differs by the larger size of the inframedian latera, and by the shape of the carina, which has a flat roof bordered by rounded ridges (as shown in Plate II, fig. 7, a diagram of the carina in transverse section). It is wider than the carina of *S. regium*. A small triangular chitinous appendage extends upward beyond the umbo of the carinal latus. The thin cuticle is quite sparsely hairy.

Length of the capitulum, 40, of peduncle 19, mm.; length of carina 38; diameter at base 9 mm.

This form was taken only at several adjacent stations southeast from Nantucket. A series of about a dozen specimens was examined, the capitula from 11 to 40 mm. long.

In those from Station 2042 the inframedian latera are higher than wide, with the apices curving slightly toward the scuta. In the specimens from Station 2041 the apices are more strongly curved.

A form closely related to *S. r. latidorsum*, said to be from a Pacific station, represented by a series of over a dozen examples, may be described here. (Plate II, figs. 9, 10, natural size.) It is No. 32916, U.S.N.M., from *Albatross* Station 3342, north latitude 52° 39′ 30″, west longitude 132° 38′, off British Columbia, in 1,588 fathoms. This form differs from *S. regium latidorsum* chiefly by the narrower roof of the carina and the larger chitinous appendages above the

umbones of carinal and inframedian latera. The capitulum is covered with a rather thin yellowish-gray cuticle, which is very shortly and delicately pilose, the pile hardly noticeable, and worn from the older portions of the valves. The scutum is like that of *S. regium*, except that the upper part is less acuminate. The carina is flat on the roof, angular or with low ribs laterally, the sides spreading a little. The base and growth lines are V-shaped, as in *regium*. The roof is not so wide as in *S. regium latidorsum*. The upper latus is like that of *S. regium*, except that its carinal border is longer. The rostrum is narrow and indistinctly visible through the cuticle. Rostrallatus is decidedly lower in comparison with its width than in *S. regium*. The triangular inframedian latus is much smaller, relatively to the size of the capitulum, than in *S. regium*, and there is a roof-like chitinous extension above its apex not noticed in *S. regium*. The carinal latera are comparatively lower than in *regium*, with a strongly recurved umbo, above which there is a chitinous extension of the plate, which extends also along the upper margin. The peduncle has larger scales than in *S. regium*, and is less pubescent. There are 7 rows of about 9 scales each.

Length of capitulum, 48; breadth, 31; length of carina, 43; diameter near base, 9.5 mm.; length of peduncle 21 mm.

The largest specimen of the lot measures—length of capitulum 60, breadth 38, length of peduncle 36 mm. It is one of the largest species of the genus.

The cirri (of the largest specimen seen) are dark brown, the first pair blackish. Branches of the first cirrus (Plate IV, fig. 10) unequal, with 11 and 13 segments, those of the anterior branch very short and broad, wider than in *S. regium*. Cirrus ii is shorter than the following, with subequal branches of about 26 segments. The other cirri are somewhat longer and subequal. The joints of the sixth cirrus have 5 or 6 pairs of long bristles along the anterior margin, with numerous fine short bristles between the major ones of each pair. The arrangement is not unlike that figured for *S. stearnsii*, except that there are more small bristles. The caudal appendage consists of 5 indistinct segments, each with a bunch of bristles, the last terminating in a group of long spines (Plate IV, fig. 14). The individual examined had no penis.

The mandible (Plate IV, fig. 12) has four teeth, the lower one very bluntly truncate, the spaces between the teeth being subequal, not unequal, as in the example of *S. regium* examined. The maxilla has a single large upper spine and a straight, closely spinose edge (Plate IV, fig. 11).

A young example has pale, corneous cirri. Whether the differences between this form and *S. regium* found in the cirri and mandibles would prove constant in a large series remains to be seen.

Attached to one of the specimens I found the single example of *S. aurivillii incertum*. The occurrence in a Pacific station of two forms so closely related to Atlantic species as these may give rise to serious doubts as to the proper labeling of the material; yet I have been unable to obtain any information indicating that the barnacles were obtained elsewhere than at the station given.

SCALPELLUM REGINA, new species.

Plate II, figs. 4, 5, 6.

Type.—Cat. No. 9647, U.S.N.M.

Type-locality.—*Albatross* Station 2376, Gulf of Mexico, north latitude 29° 03′, west longitude 88° 16′, in 324 fathoms; gray mud.

Capitulum of 14 plates, in general shape like *S. regium;* moderately compressed; covered with a densely and shortly pilose cuticle. In adult capitula the plates are separated by rather wide chitinous sutures, but in young ones they are in contact. The plates are weakly sculptured with widely spaced low wrinkles along the lines of growth, as in *S. giganteum*.

The scutum is large, twice as long as wide. The occludent margin is arcuate above, the acuminate apex being somewhat recurved. Basal and lateral margins straight, tergal margin a little concave.

The tergum is about equal to the scutum in area and decidedly longer. Occludent margin straight, the carinal and scutal margins about equally arcuate. It is divided into two areas by a straight apico-basal ridge, the carinal area being about half as wide as the scutal. The greatest width of the tergum is less than half its length.

The carina is separated from the scuta and latera by a rather wide chitinous space. It is regularly arcuate or more curved above. Umbo terminal at the apex, which is pushed slightly between the scuta. The roof is slightly convex, bounded by angles but not ridges (Plate II, fig. 4, carina in transverse section). The sides are narrow throughout, and the base projects in a triangle between the carinal latera. The lines of growth on the roof are V-shaped.

The upper latus has the tergal and scutal margins straight, a little concave near the acuminate apex, the carinal and basal margins rounded. Umbo at the apex. It is sculptured with growth lines only.

The rostrum is very small, triangular, and separates the rostral latera slightly.

The rostral latus is low, with the upper and lower margins parallel.

The inframedian latus is small, triangular, with the basal margin longest, the umbo apical.

The carinal latus is of very irregular shape. The convex posterior margins project beyond the carina, and the two latera meet below it.

The umbo is elevated, acute, and curved toward the scutal margin. A prominent ridge runs from the umbo to the scutal end of the plate and two or three inconspicuous ridges to the basal margin.

The peduncle is equal to or shorter than the capitulum, covered with large scales and clothed with a velvety cuticle. There are 10 rows of about a dozen scales each in the figured type, but old individuals have more.

Length of capitulum 43, breadth 30 mm.; length of peduncle about 26 mm. Length of the carina 40, diameter at base 6 mm.

This fine species stands between *S. regium* and *S. giganteum*. It differs from the former by the wider chitinous spaces at the sutures, the smaller inframedian and much lower carinal latera. It has not such wide chitinous sutures as *S. giganteum*, which, moreover, has a rounded carina, still lower carinal latera, and smaller scuta and terga.

S. michelottianum Seguenza, of the Italian Pliocene, is a related species.

The 16 specimens show but little variation, except in the number of scales on the peduncle, which increases with age, new longitudinal rows being interposed.

The two oldest individuals measure: Length of capitulum 46, breadth 33 mm. Peduncle 45 mm. long, with 13 rows of about 16 scales each. Length of capitulum 43, breadth 35 mm. Peduncle 40 mm. long, with 13 rows of about 18 scales each.

SCALPELLUM GIGANTEUM Gruvel.

Plates II and III, figs. 1.

1902. *S. giganteum* GRUVEL, Trans. Linn. Soc. London, 2 ser., VIII, Zoology, p. 153, pl. XVII, figs. 1–8, 17; Monographie des Cirrhipèdes, p. 78, fig. 88 (coast of Cuba in 500 fathoms).

Localities.—Cat. No. 11524, U.S.N.M., *Albatross* Station 2658, east of Florida, north latitude 28° 21′, west longitude 78° 37′, in 514 fathoms. Also, *Albatross* Station 2554, north latitude 39° 48′ 30″, west longitude 70° 41′, in 455 fathoms, on *S. velutinum*.

Twelve individuals were taken, four of them young. One of the largest has a capitulum 45 mm. long, the peduncle of about the same length. Usually only the apices of the valves are denuded of the thick, dense, gray cuticle, which is very shortly and sparsely pilose, and conceals the contours of the plates. It has been removed in the example figured on Plate II, fig. 1, to show the shape of the calcified portions of the plates.

These specimens differ from Gruvel's types by the reduction of the rostral plate, which is represented by a small granule only, or is completely absent. This plate is said to be small and oval in the original description of *giganteum*. Moreover, the carina extends a little farther down, and the rostral latera are better developed than in the types of

giganteum. These differences do not seem sufficient to call for specific separation.

The rostrum, when very small and covered by the cuticle, is subject to considerable variation, as I have found in numerous species.

The roof of the carina is rounded, in section like the letter U. This differentiates the species from other large Atlantic forms. The wide chitinous spaces between the calcified portions of the valves is a further distinguishing feature.

The single young specimen from Station 2554 extends the range of this fine species far to the north, and one very large individual, No. 32911, U.S.N.M., taken by a Gloucester fisherman, with no more precise locality than "fishing banks," indicates that *S. giganteum* may range as far north as *S. velutinum*. This individual (Plate III, fig. 1), measures: Length of capitulum 47, breadth 35, diameter 20 mm., length of peduncle about 37 mm. The uncalcified boundaries of the plates are indicated by whitish lines in the chitinous spaces.

GROUP OF SCALPELLUM GORGONIOPHILUM.

SCALPELLUM GORGONIOPHILUM, new species.

Type.—Cat. No. 9883 U.S.N.M.

Type-locality.—*Albatross* Station No. 2338, off Habana, Cuba, north latitude 23° 10′ 40″, west longitude 82° 20′ 15″, in 189 fathoms, coral bottom, on a gorgonian.

The capitulum is rather wide at the base, the carinal and occludent margins subparallel in the lower two-thirds; cream-white, the plates of the upper whorl crimson-violet tinted toward their umbones; not hairy, and with no noticeable cuticle; sculptured with rather rude growth lines and fine, indistinct radial striæ, with a stronger diagonal rib on the scutum and on the upper latus.

The scutum is long and rather narrow, with slightly arched occludent margin; lateral margin straight, subparallel to the occludent; basal margin straight, at a right angle to the occludent. It is acuminate toward the acute apex. Umbo apical.

The tergum is very long and narrow, with erect apex. The lower margin is slightly convex.

The carina is very short, its curvature chiefly near the apex. The roof is convex and radially striate, with narrow ribs separating it from the sides. The sides are wide, separated from the intraparietes by a sharply elevated arcuate rib. The umbo is apical and situated at the middle of the carinal margins of the scuta.

The upper latus has a long, straight, scutal margin; tergal and carinal margins nearly equal; basal margin quite short and oblique, formed by contact with the carinal latus. The umbo is apical.

The rostrum is comparatively large, in shape of an isosceles triangle. The rostral latus is low and wide, its surface divided by a diagonal rib.

The inframedian latus is narrow, obliquely triangular, tapering to the apex, which curves toward the scutum and overlies its baso-lateral angle. The umbo is apical.

The carinal latus is pentagonal, curved like a scoop, with the apex projecting outward beyond the carina. Three subequal faces abut on the upper and inframedian latera and the peduncle, the upper margin being longest. Behind the carina the two latera meet only at the base.

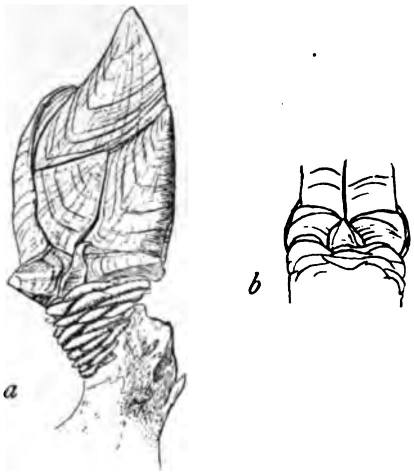


FIG. 7.—SCALPELLUM GORGONIOPHILUM. *a*, LATERAL VIEW × 4; *b*, DETAIL OF ROSTRUM.

The peduncle is stout and very short, very closely covered with projecting scales, in about 8 deeply interlocking rows of 6 or 7 scales each. It is inconspicuously hairy.

Length of the capitulum 9, breadth 5 mm.; length of the carina 6.8, diameter near the base 1.8 mm.; length of the peduncle about 2.8 mm.

This peculiar little species is represented by one example only, but it is so unlike any described form that I do not hesitate to describe it. The large size of the rostrum for a species of this group, the curious shape of the carinal latera, the short carina, and the color are its main characteristics. (Fig. 7.)

GROUP OF SCALPELLUM PORTORICANUM.

This group is characterized by the shape of the carinal latus, which is as high as wide, with the umbo at or below the middle of the carinal margin, and by the uniformly small size of the species. It comprises *S. tritonis* Hoek, *portoricanum* Pilsbry, *longicarinatum* Pilsbry, and *atlanticum* Gruvel, of the Atlantic, and *S. truncatum* Hoek, *gruvelianum* Pilsbry, and *sanctipetrense* Pilsbry, of the Pacific.

SCALPELLUM TRITONIS Hoek.

1883. *S. tritonis* HOEK, Challenger Rep., Cirripedia, p. 122, pl. v, figs. 9, 10.

Topotype.—Cat. No. 32866, U.S.N.M. *Triton* Station 10, Faröe Channel, north latitude 59° 40′, west longitude 7° 21′, 516 fathoms, in the "warm area" west of the ridge, bottom temperature 46°. August 24, 1882. Jeffreys collection.

A specimen in the Jeffreys collection was taken in the same haul which furnished the two individuals upon which Hoek based the

species. It sat upon a similar ribbed sea-urchin spine. It has the capitulum 7.5 mm. long, 4.5 wide; carina 6 mm. long, 1.6 wide at base. It agrees with Hoek's description and figures except that the rostral latus is somewhat lower and the roof of the carina increases in width more rapidly, being broader at the base than the type figure shows. These differences among examples from one station are indicative of a rather wide range of individual variation.

The species is related to *S. portoricanum*, and more distantly to the group of large forms of the *S. velutinum* type, from which it differs chiefly by the shape of the carinal latus.

SCALPELLUM PORTORICANUM, new species.

1901. *Scalpellum* (*species*)? BIGELOW, Bull. U. S. Fish Commission for 1900, II, p. 179.

Type.—Cat. No. 26353 U.S.N.M.

Type-locality.—Mayaguez Harbor, Porto Rico, between 25 and 76 fathoms, U. S. Fish Commission steamer *Fish Hawk*, 1898–99.

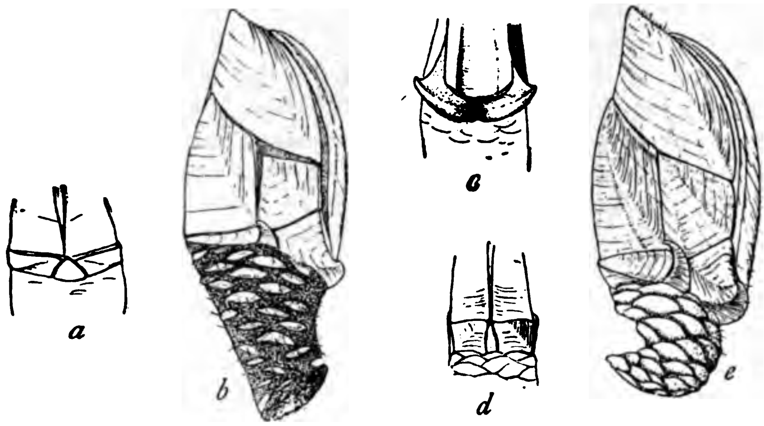


FIG. 8.—SCALPELLUM PORTORICANUM *a*, *c*, ROSTRAL AND CARINAL DETAILS; *b*, LATERAL VIEW × 2½; *d*, *e*, S. PORTORICANUM INTONSUM. *d*, DETAIL OF ROSTRUM; *e*, LATERAL VIEW × 4.

The capitulum is rhombic-oblong, composed of 14 wholly calcified plates, covered with a very thin and sparsely pilose cuticle. The plates are weakly marked with lines of growth. The occludent margin of the capitulum is nearly straight.

The scutum is trapezoidal, more than twice as long as wide, occludent and lateral margins parallel and straight, basal margin straight, nearly at right angles to the occludent margin. Umbo apical, not projecting beyond the occludent outline.

The tergum is longer than the scutum and greater in area. Occludent margin straight; basal and carinal margins convex. The apex is erect.

The carina is not much curved, its umbo apical, against but hardly between the terga. The roof is flat, bounded by low lateral ribs, and

faintly marked with arcuate growth-lines. The sides are narrow and concave. Basal margin a little convex.

The upper lateral plate is pentagonal, the tergal and scutal margins longer, subequal, the carinal side shorter and about equal to that against the carinal lateral plate. The side opposed to the inframedian lateral plate is shortest. The umbo is superior, acute, and terminal.

The rostrum is small and triangular, the basal margin slightly greater than the height.

The rostral latus is very narrow, the scutal and basal margins parallel.

The inframedian latus is triangular, the apex curving ventrad, around the end of the rostral lateral plate and between the lower angles of the upper lateral plate and the scutum.

The carinal latus is irregularly triangular. It projects backward beyond the carina. The umbo is recurved and flares outwards, in the shape of a short subspiral horn.

The peduncle is short, with about 13 rows of transversely lengthened scales, about 6 in a row.

Length of the capitulum 12, width 7.7 mm.; length of peduncle 7 mm. Length of the carina 11.3, diameter at base 2.2 mm.

A single example was taken, either at Station 6062 or Station 6063. It was supposed by Mr. Bigelow to be young, but comparison with numerous young examples of the related species of equal size with *S. portoricanum* shows that the Porto Rican form is distinct. It has some resemblance to *S. velutinum* Hoek, but compared with young individuals of equal size, *S. portoricanum* differs markedly by the much narrower roof of the carina, which is in width only one-fifth the length. The rostrum is much larger and the inframedian and carinal latera are of a different shape. *S. pedunculatum* Hoek, from near New Zealand, is also somewhat similar, but the plates of the lower whorl differ.

S. portoricanum is allied to *S. tritonis* Hoek, but differs in the following respects: The occludent margin is straight, not convex; the carinal latera are distinctly wider than high, with outwardly flaring umbones; the sides of the carina are narrower above; finally, the scutum and upper latus differ somewhat in shape.

S. hirsutum Hoek, *hispidum* Sars, *rubrum* Hoek, and *atlanticum* Gruvel have more or less resemblance to *S. portoricanum*, but all differ in various characters of the valves. (Fig. 8 *a–e*.)

SCALPELLUM PORTORICANUM INTONSUM, new subspecies.

Cotypes.—Cat. No. 9757, U.S.N.M.

Type-locality.—*Albatross* Station No. 2401, north latitude 28° 38′ 30″, west longitude 85° 52′ 30″, in 142 fathoms.

There is a series of three individuals taken by the *Albatross* in the Gulf of Mexico west of Florida. They are smaller than the Porto

Rican type, rather densely hairy, and differ from typical *S. portoricanum* somewhat in shape. The capitula measure 9.5, 9.7, and 7 mm. long. The occludent margin of the scutum is distinctly convex, that of the tergum straight or even a trifle concave. The summit is erect, not recurved. The inframedian latus is longer and narrower than in *S. portoricanum*. The rostrum is narrower. The umbones of the carinal latera project less and are situated higher. The valves are sculptured with concentric grooves at subequal intervals. The two larger examples are evidently adult. (Fig. 8 *d*, *e*.)

In the figure the hairs of the cuticle are omitted.

SCALPELLUM LONGICARINATUM, new species.

Type.—Cat. No. 11534, U.S.N.M.

Type-locality.—*Albatross* Station 2668, off northern Florida, north latitude 30° 58′ 30″, west longitude 79° 38′ 30″, 294 fathoms.

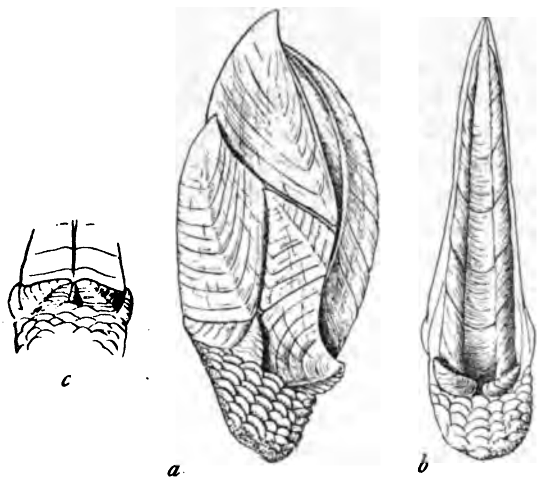


FIG. 9.—SCALPELLUM LONGICARINATUM *a*, LATERAL VIEW; *b*, CARINAL VIEW; *c*, ROSTRAL VIEW × 5.

Other localities.—Cat. No. 14557, U.S.N.M. *Albatross* Station 2415, north latitude 30° 44′, west longitude 79° 26′, 440 fathoms. Cat. No. 14560, U.S.N.M. *Albatross* Station 2663, north latitude 29° 39′, west longitude 79° 49′, in 421 fathoms. Bottom temperature 42.7°F.

The capitulum is long-oval, widest in the middle, both margins convex, but the ventral border is less curved than the dorsal. Composed of 14 fully calcified valves. Cuticle thin, sparsely hairy. Sutures linear. The plates are closely and rather strongly sculptured with unequal lines of growth, with strong grooves at intervals.

The scutum is trapezoidal, the length more than twice the breadth. The occludent margin is convex, the apex acuminate and recurved within the ventral outline, overlying the base of the tergum. The

lateral margin is straight and nearly parallel to the occludent. The straight basal margin meets the others in right angles.

The tergum is triangular, somewhat longer than the scuta. The occludent and basal margins are slightly convex; the carinal margin is slightly concave near the summit, a little convex elsewhere.

The carina is evenly curved with apical umbo. The roof is flat between strong bordering ribs. The sides are wide and divided by a curved sulcus. There are rather deep, spaced growth lines. The basal margin is convex.

The upper latus is quadrangular, the scutal and carinal margins parallel, the carinal about half as long as the scutal. The tergal and basal margins are straight, longer than the carinal. The umbo is apical.

The rostrum is quite small and triangular. The rostral latus is trapezoidal, with parallel upper and basal margins, the basal much the shorter. The height of the plate is scarcely half its length.

The inframedian latus is narrowly triangular, the base about half the height. Umbo apical. There is an inconspicuous triangular wing at the carinal side of the apex.

The carinal latus is very irregularly pentagonal, as wide as high. The carinal margin is concave. The umbones project a little beyond the carina and are somewhat recurved; the margin below them is convex. The portions of the carinal latera, seen in a dorsal view, are obliquely triangular, the roof of the carina extending triangularly between them to the peduncle.

The peduncle is very short, closely covered with transversely lengthened scales, in about 18 rows of about 7 or 8 scales each.

Length of the capitulum 10, breadth 5.4 mm. Length of the peduncle 2 mm. Length of the carina 9.5, diameter at base 2 mm.

This is a strong, robust little species, with unusually emphatic concentric sculpture of striæ and spaced grooves on the plates. It is most nearly related to *S. atlanticum* Gruvel,[a] but in *S. longicarinatum* the carina is less curved above, its sides are wider near the base, and the ribs bordering the roof are very strong. The rostrum and inframedian latus are also unlike in the two forms. *S. longicarinatum* differs from *S. portoricanum* by the erect shape of the inframedian latus, the wider sides and heavy bordering ribs of the carina, and by the general shape of the capitulum, which tapers toward the base, and is more lengthened. It is probably related also to the still unfigured *S. mammillatum* Aurivillius, from off the Azores, but the rostral latera are of a different shape. *S. tenue* Hoek is also related, yet several of the plates differ in shape, and *S. longicarinatum* has a distinct rostrum. The Californian *S. gruvelianum* Pilsbry is allied, but has a shorter carina. In *S. longicarinatum* the carina is nearly as

[a] Expedition du Travailleur et du Talisman, Cirrhipèdes, pl. II, figs. 17, 18.

long as the whole capitulum and extends almost to the apices of the terga.

The largest specimen of the type lot has a capitulum fully 11 mm. long.

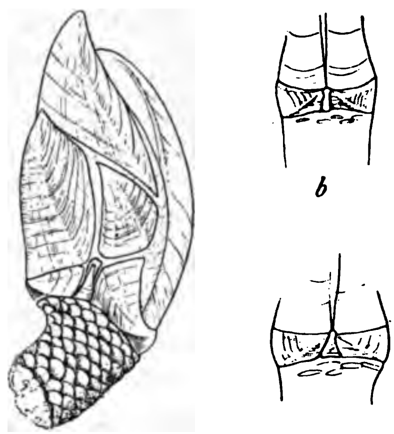
Examples from Station 2415 have a more hairy cuticle than the type lot, largely concealing the plates. They are attached to a branching *Oculina*-like coral. (Fig. 9.)

SCALPELLUM SANCTIPETRENSE, new species.

Type.—Cat. No. 32898, U.S.N.M.

Type-locality.—San Pedro, California, in 50 to 75 fathoms. Mrs. Oldroyd.

The capitulum is narrow and long, the length more than twice the width; occludent margin nearly straight, the carinal regularly arched; composed of 14 fully calcified plates, covered with a thin, very short hairy cuticle. The plates are weakly marked with growth lines, and some weak, very faint, radial striæ.


b

a c

FIG. 10.—SCALPELLUM SANCTIPETRENSE. *a*, LATERAL VIEW × 5; *b*, *c*, ROSTRAL VIEWS OF TWO COTYPES.

The scutum is much more than twice as long as wide, with moderately convex occludent margin. The lateral margin is straight, parallel to the occludent. The umbo is at the acute apex.

The tergum is larger than the scutum, triangular, its occludent margin arched, scutal margin straight, the carinal margin nearly straight, being very weakly concave above and convex below. The plate projects above the summit of the carina only about one-fifth of its carinal length.

The carina is very long, weakly, evenly arched, with apical umbo. The roof is deeply channeled between strong, rounded bordering ribs. The sides are rather wide throughout. There is a small arcuate riblet dividing off a small intraparietal area near the beak. The base of the carina projects triangularly between the carinal latera.

The upper latus is long, with five unequal sides. The scutal margin is longest, and slightly concave. The straight tegal and carinal margins are about equal. The basal margin against the carinal latus is straight, shorter, but about twice the length of the margin against the inframedian latus. The umbo is subterminal.

The rostrum is small and triangular or oblong as high as the rostral latera.

The rostral latus is trapezoidal, its length about double the height. The rostral margin is much shorter than the lateral and the scutal margin is longer than the basal.

The inframedian latus is oblong, its height decidedly over twice the width, trapezoidal, with the umbo raised, close to the rostral border of the plate, at its upper third. The upper end of the plate presents a very short face to the angle of the scutum and a longer one against the upper latus.

The carinal latus is triangular in general shape, though with five sides. The basal and carinal margins are longest; the upper and lateral margins shorter and subequal. The short margin below the carina is arched, and projects slightly beyond the carinal outline. The umbones are below the lower fourth of the dorsal border of the plate.

The peduncle is short, oblique to the capitulum, and covered with imbricating scales in about 13 rows.

Length of the capitulum 8, breadth 3.7 mm. Length of the peduncle 2.6 mm. Length of the carina 7.2, diameter at base 1.1 mm.

This little species is related to *S. gruvelianum*, but it is distinct by the longer, narrower capitulum with consequent differences in the shapes of the individual plates. The umbo of the inframedian latus is not apical, the carina is less curved, and the rostrum is well developed. *S. sanctipetrense* has also much resemblance to the Atlantic *S. longicarinatum*.

Four specimens, of about equal size, were taken.

In some the rostrum is distinctly triangular, in others more of an oblong shape. (Fig. 10.)

SCALPELLUM GRUVELIANUM Pilsbry.

1907. *S. gruvelianum* Pilsbry, Bulletin of the Bureau of Fisheries, XXVI, p. 197, pl. VII, figs. 1–3, Southwest rock, Santa Barbara Island, 238 fathoms.

In addition to the type-locality, this species was taken at *Albatross* stations 2980, 603 fathoms, and 2947, 269 fathoms, both off southern California. There is a minute rostrum in some examples, but in others it cannot be distinguished.

GROUP OF SCALPELLUM RATHBUNÆ.

Forms similar to the group of *S. portoricanum* except that the inframedian latus has a peculiar and characteristic shape.

SCALPELLUM RATHBUNÆ, new species.

Type.—Cat. No. 32912 U.S.N.M.

Type-locality.—*Albatross* Station 2768, off the east coast of Patagonia, south latitude 42° 24′, west longitude 38° 30′, in 43 fathoms.

long as the whole capitulum and extends almost to the apices of the terga.

The largest specimen of the type lot has a capitulum fully 11 mm. long.

Examples from Station 2415 have a more hairy cuticle than the type lot, largely concealing the plates. They are attached to a branching *Oculina*-like coral. (Fig. 9.)

SCALPELLUM SANCTIPETRENSE, new species.

Type.—Cat. No. 32898, U.S.N.M.

Type-locality.—San Pedro, California, in 50 to 75 fathoms. Mrs. Oldroyd.

The capitulum is narrow and long, the length more than twice the width; occludent margin nearly straight, the carinal regularly arched; composed of 14 fully calcified plates, covered with a thin, very short hairy cuticle. The plates are weakly marked with growth lines, and some weak, very faint, radial striæ.

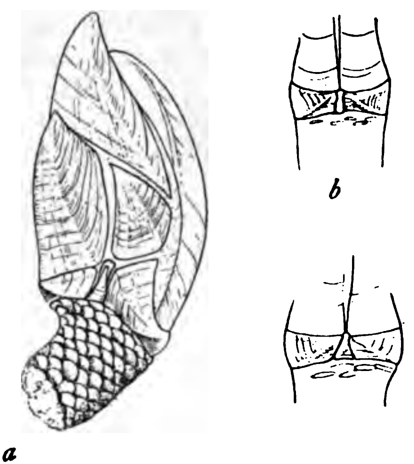


FIG. 10.—SCALPELLUM SANCTIPETRENSE. *a*, LATERAL VIEW × 5; *b*, *c*, ROSTRAL VIEWS OF TWO COTYPES.

The scutum is much more than twice as long as wide, with moderately convex occludent margin. The lateral margin is straight, parallel to the occludent. The umbo is at the acute apex.

The tergum is larger than the scutum, triangular, its occludent margin arched, scutal margin straight, the carinal margin nearly straight, being very weakly concave above and convex below. The plate projects above the summit of the carina only about one-fifth of its carinal length.

The carina is very long, weakly, evenly arched, with apical umbo. The roof is deeply channeled between strong, rounded bordering ribs. The sides are rather wide throughout. There is a small arcuate riblet dividing off a small intraparietal area near the beak. The base of the carina projects triangularly between the carinal latera.

The upper latus is long, with five unequal sides. The scutal margin is longest, and slightly concave. The straight tegal and carinal margins are about equal. The basal margin against the carinal latus is straight, shorter, but about twice the length of the margin against the inframedian latus. The umbo is subterminal.

The rostrum is small and triangular or oblong as high as the rostral latera.

The rostral latus is trapezoidal, its length about double the height. The rostral margin is much shorter than the lateral and the scutal margin is longer than the basal.

The inframedian latus is oblong, its height decidedly over twice the width, trapezoidal, with the umbo raised, close to the rostral border of the plate, at its upper third. The upper end of the plate presents a very short face to the angle of the scutum and a longer one against the upper latus.

The carinal latus is triangular in general shape, though with five sides. The basal and carinal margins are longest; the upper and lateral margins shorter and subequal. The short margin below the carina is arched, and projects slightly beyond the carinal outline. The umbones are below the lower fourth of the dorsal border of the plate.

The peduncle is short, oblique to the capitulum, and covered with imbricating scales in about 13 rows.

Length of the capitulum 8, breadth 3.7 mm. Length of the peduncle 2.6 mm. Length of the carina 7.2, diameter at base 1.1 mm.

This little species is related to *S. gruvelianum*, but it is distinct by the longer, narrower capitulum with consequent differences in the shapes of the individual plates. The umbo of the inframedian latus is not apical, the carina is less curved, and the rostrum is well developed. *S. sanctipetrense* has also much resemblance to the Atlantic *S. longicarinatum*.

Four specimens, of about equal size, were taken.

In some the rostrum is distinctly triangular, in others more of an oblong shape. (Fig. 10.)

SCALPELLUM GRUVELIANUM Pilsbry.

1907. *S. gruvelianum* PILSBRY, Bulletin of the Bureau of Fisheries, XXVI, p. 197, pl. VII, figs. 1–3, Southwest rock, Santa Barbara Island, 238 fathoms.

In addition to the type-locality, this species was taken at *Albatross* stations 2980, 603 fathoms, and 2947, 269 fathoms, both off southern California. There is a minute rostrum in some examples, but in others it cannot be distinguished.

GROUP OF SCALPELLUM RATHBUNÆ.

Forms similar to the group of *S. portoricanum* except that the inframedian latus has a peculiar and characteristic shape.

SCALPELLUM RATHBUNÆ, new species.

Type.—Cat. No. 32912 U.S.N.M.

Type-locality.—*Albatross* Station 2768, off the east coast of Patagonia, south latitude 42° 24′, west longitude 38° 30′, in 43 fathoms.

The capitulum is of the usual quadrate form, the plates separated by narrow but distinct chitinous sutures, covered with a very thin, smooth cuticle. The occludent border is straight, except near the apex.

The scutum is quadrangular, with straight occludent margin. The length is about twice the width. Umbo at the acute apex. The surface is divided into an anterior radially costate and a tergo-lateral smooth area.

The tergum is a little longer than the scutum. The occludent margin is convex above, the apex being recurved. The scuto-lateral margin is slightly convex, the carinal margin nearly straight.

The carina is regularly and rather strongly curved, with the umbo terminal. The roof is deeply groved between strong sulcate bordering ribs. The sides are rather narrow and of nearly equal width throughout.

The upper lateral plate is quadrangular, the scutal margin longest, slightly concave, parallel to the carinal margin. Tergal margin straight. Basal margin oblique. The scutal half of the plate is sculptured with a few radiating riblets. Umbo at the apex.

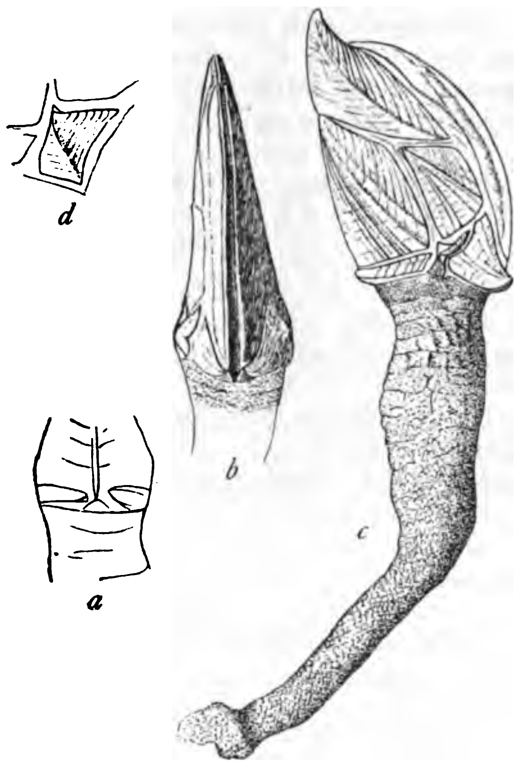


Fig. 11.—Scalpellum rathbunæ. *a*, rostral, *b*, carinal, and *c*, lateral views of type × 2; *d*, inframedian latus of another individual × 4.

The rostrum is triangular, very small and short, somewhat wider than high.

The rostral latus is low, the length of the plate being more than four times its width. The upper and lower margins are parallel. An angle runs obliquely from the beak toward the baso-lateral angle.

The inframedian latus is quadrangular, with one of the upper angles produced toward the carina. The umbo is subcentral, a little nearer the rostral margin; from it a rib runs to each of the angles of the plate.

The carinal latus is triangular, with the umbo projecting beyond the base of the carina and a little recurved. Several ribs radiate from the umbo.

The peduncle is about as long as the capitulum, closely covered with an open mosaic or pavement of very minute, scarcely imbricating scales, of about 0.2 or 0.3 mm. width.

Length of capitulum 20, width 12 mm. Length of peduncle 21 mm. Length of the carina 19, diameter at base 2 mm.

In this species the inframedian lateral plate is of a peculiar irregular shape. The rostral latera are narrow, unlike those of related species.

A second example from the same station as the type differs by having the bordering ribs almost obliterated on the lower half of the carina, and the inframedian lateral plate on the left side is almost regularly quadrate (fig. 11*d*).

This species is named for Miss Mary J. Rathbun, the accomplished carcinologist of the United States National Museum. (Fig. 11.)

SCALPELLUM SOROR, new species.

Type.—Cat. No. 32913, U.S.N.M.

Type-locality.—*Albatross* Station 2818, Galapagos Islands, south latitude 36′ 30″, west longitude 89° 19′, 634 fathoms, bottom temperature 39.9°.

The capitulum is nearly twice as long as wide, the plates nearly in contact, joined by narrow chitinous sutures, covered by a very thin smooth cuticle. The ventral (occludent) border is straight.

The scutum is narrow, the width contained 2½ times in the length; occludent and lateral margins are straight and parallel, the basal margin nearly at right angles with them. There is a very weak rib along the occludent margin, and another from apex to the baso-lateral angle; elsewhere the surface is marked with weak, widely spaced growth-wrinkles only.

The tergum is a trifle longer than the scutum, nearly three times as long as wide. The occludent margin is straight, the baso-lateral slightly convex, the carinal margin is slightly concave near the apex, elsewhere slightly convex. It has weak sculpture of widely spaced V-shaped growth-lines.

The carina is well curved, with apical umbo. Roof deeply channeled between two stout marginal ribs. Sides narrow. Basal margin rounded.

The upper lateral plate is quadrangular, the scutal and carinal borders straight and parallel, the scutal more than double the length of the carinal. The tergal margin is straight. Umbo acute and terminal. The surface is marked with growth-lines only.

There is a minute oval rostrum, deeply embedded in the cuticle and readily overlooked.

The rostral latera are small, wedge-shaped, their acute apices meeting on the ventral line.

The inframedian latus is of very irregular shape, narrowly oblong, with one upper angle produced toward the carina. The umbo is at the upper third of the plate on the rostral side, the wedge-shaped surface below it being raised above the rest of the plate.

The carinal latus is imperfectly triangular, with a convex margin projecting below the carina, the umbo being a little recurved, situated at the bases of the ribs of the carina and at about a third the height of the plate. The basal margin is about equal to the lateral margin. The latter is sinuous, concave in the middle, for the reception of the upper lobe of the inframedian plate.

The peduncle is shorter than the capitulum, closely covered with imbricating scales about 1 mm. wide.

Length of the capitulum 17, breadth 8.7 mm. Length of the peduncle 9 mm. Length of the carina 16, diameter at base 3.3 mm.

This species closely resembles *S. rathbunæ*, from which it differs chiefly by the absence of radial riblets on the scuta and upper latera, the wider roof of the carina, its bordering ribs not sulcate, and by the very much larger scales of the peduncle. *S. soror* is like *S. rathbunæ* in the very peculiar shape of the inframedian latera. (Fig. 12.)

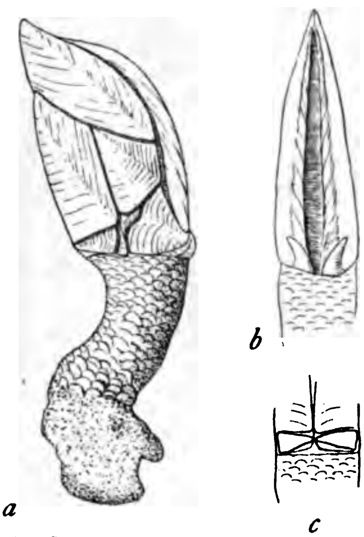


FIG. 12.—SCALPELLUM SOROR. *a*, LATERAL VIEW; *b*, CARINAL VIEW; *c*, ROSTRAL VIEW, × 2.

GROUP OF SCALPELLUM ARIETINUM.

The carinal latera project far downward and flare outward below the carina, with the umbones at their free ends. This modification is unlike any other hitherto known species.

SCALPELLUM ARIETINUM, new species.

Type.—Cat. No. 9792, U.S.N.M.

Type-locality.—*Albatross* Station 2405, Gulf of Mexico, north latitude 28° 45′, west longitude 85° 02′, in 30 fathoms.

Other localities.—Cat. No. 10055. *Albatross* Station 2315, Straits of Florida, north latitude 24° 26′, west longitude 81° 48′ 15″ in 37 fathoms, on spines of *Cidaris tribuloides*.

The capitulum is subtrapezoidal, the occludent border straight; of a crimson color (or more or less tinted with crimson on a yellowish

ground); composed of 14 fully calcified plates separated by linear sutures. The plates are sculptured with growth-lines and some fine, indistinct radial striæ. The cuticle is thin and inconspicuous, nearly smooth except on the keel, where the roof is finely and shortly pilose, and crossed by six to eight transverse tufts of longer hairs.

The scutum is about twice as long as wide, its occludent margin very slightly convex. The lateral margin is concave near the tergo-lateral angle, elsewhere convex. Basal margin straight. The umbo is nearly terminal, bent inward, with a very small triangular area outside and extending slightly above it, at least in old individuals.

The tergum is much longer than the scutum, triangular. Its occludent margin is nearly straight, but recedes slightly near the erect apex. Scutal margin is straight. The carinal margin has a slight prominence just above the summit of the carina.

The carina is moderately arched, and *extends a short distance above the prominent umbo.* Its upper end is rounded, and not in the least interposed between the scuta. The roof is nearly flat, bounded by distinct but obtuse angles. A low rib runs on each side parallel to and near the angles. The lines of growth on the roof are deeply arched downward. The sides are flat and very wide in the upper half, delicately sculptured with fine longitudinal and radial striæ. The basal margin is deeply rounded. There is no chitinous space between the carina and the other plates.

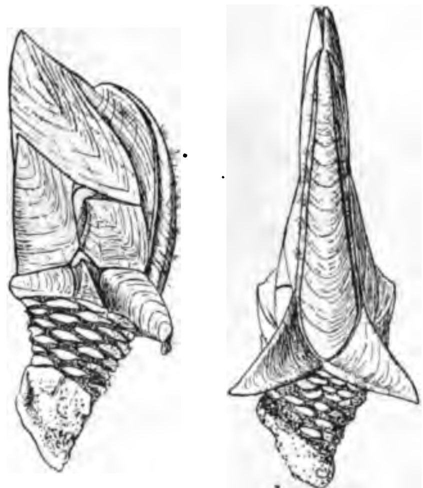

a *b*

FIG. 13.—SCALPELLUM ARIETINUM. *a*, LATERAL VIEW, × 3; *b*, DORSAL VIEW × 4.

The upper latus is pentagonal, the scutal and carinal margins about equal and parallel, the tergal margin a trifle longer. The basal margin is shorter, and the oblique margin against the inframedian plate is still shorter. The umbo is not quite apical, the apex beyond it being obtuse, rounded, and white.

The rostrum is quite small and triangular, with equal sides.

The rostral latus is low, about five times as long as high, and somewhat narrower in front than at the lateral end. It stands out in relief above the surface of the scutum.

The inframedian latus is irregularly pentagonal, about twice as high as wide. It has a short, straight margin against the lateral edge of the scutum, a longer straight one against the upper latus, about as long

as the somewhat concave margins against the carinal and rostral latera. The umbo is elevated and at the upper fourth of the plate. From it obtuse ridges radiate to the two basal angles of the plate.

The carinal latus is somewhat triangular. Its apical half projects free behind and below the carina, flaring strongly outward and noticeably twisted. Apex acute. In dorsal view the carina is seen to extend between the horn-like latera nearly to the peduncle. The spread from apex to apex of the two carinal latera is 6 mm. in the type specimen.

The peduncle is short, covered with rather large scales in about 13 rows of about 8 scales each.

Length of the capitulum 11.6, breadth 7 mm. Length of the peduncle 6 mm. Length of carina 12 mm., diameter near base 1.7 mm.

The laterally-flaring, horn-like carinal latera, the wide sides of the carina, and the position of its umbo, as well as the more or less ruddy color, all distinguish this fine species. (Fig. 13.)

SCALPELLUM DICERATUM new species.

Type.—Cat. No. 11181 U.S.N.M.

Type-locality.—*Albatross* Station 2319–2350, off Habana, Cuba, on crinoid arms.

Other localities.—Cat. No. 32867. *Albatross* Station 2405, Gulf of Mexico, west of Florida, 30 fathoms. No. 32868. *Albatross* Station 2324, off Habana, 33 fathoms, on a *Cidaris* spine. No. 32869. *Albatross* Station 2315, Straits of Florida, 37 fathoms. No. 9474. *Albatross* Station 2317, Straits of Florida, north latitude 24° 25′ 45″, west longitude 81° 46′, in 45 fathoms, temperature 75° F., on the spines of *Cidaris*.

The capitulum is similar in shape and general appearance to that of *S. arietinum*. The ventral margin is nearly straight, but with a low prominence in the middle. It is more or less deeply crimson tinted, but varies to creamy white in some individuals.

The scutum has a terminal mucro, and is shaped like that of *S. arietinum*. The tergum is also like that of *S. arietinum*.

The carina is well arched, with an *acute, apical umbo, which intrudes between the terga.* The roof is convex, with about 8 arcuate, transverse hair tufts, as in *S. arietinum*. The sides are bicostate and *very narrow*, not widened above. Basal margin rounded.

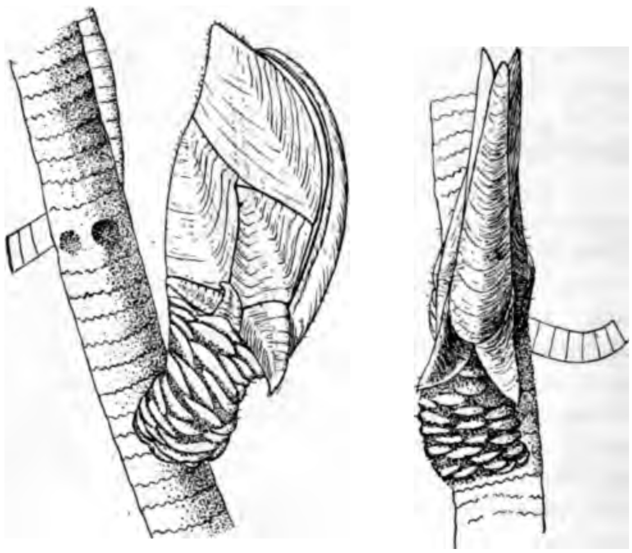
The upper latus is pentagonal, the scutal margin longest, the tergal, carinal and basal successively shorter, the margin against the inframedian plate shortest, less than half the basal margin. The umbo is acute and terminal.

The rostrum is very small and triangular. The rostral latus is shaped like that of *S. arietinum*. It has two low ridges running from the apex to the upper and lower angles of the lateral end of the plate.

The inframedian latus is narrow, *triangular, with the apex strongly curved toward the occludent border*, overlying the baso-lateral angle of the scutum. A low rounded rib runs down each side. The umbo is apical.

The carinal latus is triangular, its apical half projecting free behind and downward below the carina, and also flaring outward, though less than in *S. arietinum*. The spread from tip to tip is 3.75 mm. in the type specimen.

The peduncle is clothed with rather large, narrow, transversely lengthened scales, in about 8 rows of 8 or 9 scales each.



a b

FIG. 14.—SCALPELLUM DICERATUM. *a*, LATERAL VIEW; AND *b*, CARINAL VIEW × 8.

Length of the capitulum 13.5, width 7.8 mm. Length of the peduncle 7 mm. Length of the carina 13.5, diameter near the base 2.8 mm.

This species lives with *S. arietinum* on the spines of echinoids and the arms of crinoids, in shallow or moderate depths. The two species are obviously related, yet quite distinct by the difference in shape of the carina and inframedian latus, and the terminal umbones of the inframedian and upper latera and of the carina in *S. diceratum*, while in *S. arietinum* the umbones of these plates are removed from the apices. There are also some minor differences in other plates, readily seen in the figures. The carinal latera sometimes diverge almost as widely as in *S. arietinum*, and much more than in the figured type. The color varies from crimson to pure white. (Fig. 14.)

Section V.

Rostral latus high with short basal border, usually larger than the narrow inframedian latus; rostrum narrow or wanting; umbo of the carina apical or subapical; carinal latus higher than wide, the umbo not projecting; plates 13 or 14.

A numerous group of small, deep-water species, evidently related to *Holoscalpellum*. The complemental males so far as known are like those of *Holoscalpellum*.

KEY TO SPECIES.

a. Inframedian latus wineglass- or hourglass-shaped, being dilated toward the two ends, more or less contracted at or below the middle; the umbo at or below the middle.

b. Upper portion of inframedian latus much more expanded than the lower.

c. Lower margin of the upper latus straight; no rostrum.

d. Plates sculptured with widely-spaced low riblets parallel to lines of growth. growth. California .... *S. proximum.*

dd. Plates with sculpture of unequal growth-wrinkles, and fine, low radial striæ. Antilles, etc .... *S. idioplax.*

cc. Lower margin of the upper latus concave or sinuate; plates marked with weak, spaced growth-wrinkles only; umbo of inframedian latus median; a minute, rounded rostrum between the apices of the rostral latera. Atlantic .... *S. sinuatum.*

bb. Upper portion of the rather narrow inframedian latus not much wider than the basal portion.

c. Roof of the carina strongly convex, the umbo apical. Atlantic. *S. gracilius.*

cc. Roof of carina flat or nearly so.

d. Umbo of carina removed a short distance from the apex; Atlantic. *S. carinatum.*

dd. Umbo of carina apical.

e. Carina angular at the sides of the slightly convex roof, the sides narrow; umbo of upper latus not entering a bay in the scutum. Southern California .... *S. perlongum.*

ee. Carina with slight ribs at the sides of the flat roof, the sides wide in the upper part; umbo of upper latus entering a bay in the scutum. Atlantic. *S. albatrossianum.*

aa. Inframedian latus narrowly triangular, tapering upward to the acute apical umbo.

b. Carina unusually short, with strongly convex roof.

c. Carina not extending up beyond middle of the carinal margin of tergum; rostrum vestigeal or wanting; carinal latus rather small, triangular; inframedian latus reduced .... *S. pentacrinarum.*

cc. Carina extending above middle of terga; rostrum narrow but well developed; carinal latus pentagonal, very large; inframedian latus well developed. *S. micrum.*

bb. Carina long, its roof flattened, often with bordering ribs.

c. Plates of the upper whorl with strong radial sculpture. Atlantic. *S. formosum.*

cc. Plates of the upper whorl without conspicuous radial sculpture; inframedian latus very narrow.

d. Rostrum well developed; occludent margin convex; off Chile.... *S. gracile.*

dd. Rostrum wanting or represented by a linear rudiment.

e. Umbo of carinal latus at baso-carinal angle ....*S. antillarum.*

ee. Umbo of carinal latus at the middle to lower fourth of its carinal margin; carinal aspect of carinal latera radially ribbed.

f. Carina with ribs bounding the flat roof; umbo of carinal latus at the lower third or fourth.

g. Entire carinal latus sculptured with radiating riblets; growth-lines on roof of carina V-shaped; umbo of upper latus terminal at scuto-tergal angle ....*S. semisculptum.*

gg. Only the basal area of carinal latus radially sculptured; growth-lines on the roof straight; umbo of upper latus not terminal. *S. aurivillii.*

ff. Carina angular at the sides of the flat roof; umbo of carinal latus near middle of its carinal margin; carinal latera meeting in a rather long zigzag suture below the carina; rostrum linear; occludent margin straight ....*S. galapaganum.*

GROUP OF SCALPELLUM IDIOPLAX.

Inframedian latus hourglass- or wineglass-shaped, the umbo median or below, at the contracted part of the plate.

SCALPELLUM PROXIMUM Pilsbry.

1907. *Scalpellum proximum* Pilsbry, Bulletin of the Bureau of Fisheries, XXVI, p. 197, pl. VI, figs. 9–11.

Type.—Cat. No. 32422 U.S.N.M.

Type-locality.—Vicinity of San Diego, California, in 1,000 fathoms.

SCALPELLUM IDIOPLAX, new species.

Type.—Cat. No. 7843, U.S.N.M.

Type-locality.—*Albatross* Station 2140, Caribbean Sea, north latitude 17° 36′ 10″, west longitude 76° 46′ 05″, in 966 fathoms, sand.

Other localities.—Cat. Nos. 11530 and 14558, *Albatross* Station 2656, between Bahamas and Cape Fear, North Carolina, in 572 fathoms.

The capitulum is twice as long as wide, widest in the middle, tapering toward summit and base. The ventral and dorsal margins are about equally convex. It is composed of 13 fully calcified plates. The cuticle is very thin and smooth. The plates are sculptured with unequal lines of growth and fine, low, radial striæ.

The scutum is more than twice as long as wide. The occludent margin is convex; basal and upper margins nearly straight, oblique. The lateral margin is irregular. It projects in an angular lobe at the upper lateral angle, and is deeply excavated below the lobe for the reception of the apex of the upper lateral plate. The apex is acuminate.

The tergum is decidedly longer than the scutum, triangular, the occludent margin slightly convex, the basal a trifle concave, and the

carinal margin is very weakly sigmoid, being concave in its upper portion, convex in the lower.

The carina is long, more arcuate near the terminal mucro. The roof is flat, with bordering ribs. The fine growth-striæ across the roof are convex upwardly. The sides are rather wide, regularly tapering toward the base. The basal margin is slightly concave.

The upper lateral plate is hexagonal-piriform. The scutal and tergal margins are long and a little concave. The carinal margin and that against the carinal latus are short and equal. The basal margin, against the summit of the inframedian latus, and the apical border, against the latero-tergal lobe of the scutum, are very short. The apex is subterminal.

There is no rostrum.

The rostral latus is square, about as high as wide. The margins are straight. The lower lateral corner is rounded. The ventral margins of the rostral latera are in contact.

The inframedian lateral plate is wineglass shaped, composed of a very small basal and large upper segment, very narrow at their junction, where the umbo is situated. The upper margin has a longer scutal margin and a shorter margin in contact with the upper lateral plate.

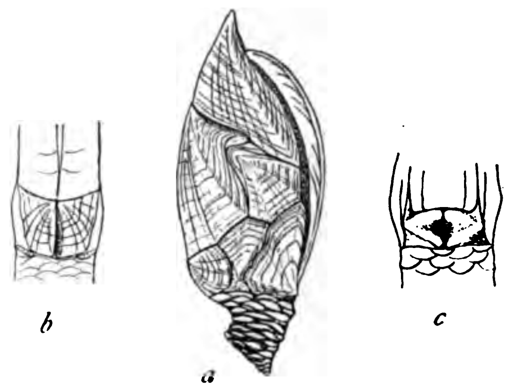


FIG. 15.—SCALPELLUM IDIOPLAX. a, LATERAL VIEW × 2; b, ROSTRAL VIEW; c, DORSAL VIEW.

The carinal latus is twice as high as wide, of very irregular shape. The umbo projects slightly beyond the carina, near the base of the plate. The carinal latera meet below the keel.

The peduncle is very short, with 10 rows of transversely lengthened scales, about 8 scales in a row.

Length of the capitulum 18, breadth 9 mm. Length of the peduncle 4.3 mm. Length of the carina 15, diameter at base 3 mm.

This species is well characterized by the wineglass-shaped inframedian lateral plate and the peculiar contour of the inner margin of the scutum.

It is closely related to *S. distinctum* Hoek, a Pacific species; but that has the scuta, upper latera, and rostral latera different in shape. *S. carinatum* Hoek, from off Tristan da Cunha, resembles *S. idioplax* in the shape of the scutum, upper latus, and inframedian latus, but it

differs by having the umbo of the carina removed from the summit, by the shape of the tergum and the presence of a minute rostrum.

Besides several examples from the type locality, in the Caribbean Sea, two specimens were taken at a station north of the Bahamas. These differ from the types by their smaller size—the larger having a capitulum 11 mm. long—and by the weaker radial striæ, which are very minute. (Fig. 15.)

SCALPELLUM SINUATUM, new species.

Type.—Cat. No. 9013, U.S.N.M.

Type-locality.—*Albatross* Station 2037, east of Maryland, north latitude 38° 53′, west longitude 69° 23′ 30″, in 1,731 fathoms, bottom temperature 38° F.

The capitulum is trapezoidal, about twice as long as wide, with slightly curved occludent border, and of a pale yellowish-white tint; not hairy; valves 14, nearly smooth.

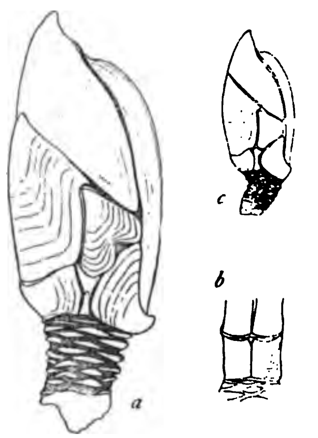


FIG. 16.—SCALPELLUM SINUATUM. *a*, *b*, LATERAL VIEW AND ROSTRAL DETAIL OF TYPE, AND *c*, A YOUNG TOPOTYPE. ALL × 3.

The scutum has a convex occludent margin. The lateral margin is produced in a point at the tergal end, excavated below it. The basal margin is somewhat convex.

The scutum is of the usual triangular shape, with convex occludent margin and narrow, slightly recurved apex. There is a slight prominence on the carinal margin above the carina.

The carina is long, arcuate, with apical umbo. The roof is flat between two moderate rounded ribs. The sides are rather wide above, tapering to the base.

The upper lateral plate is subtriangular, with a deep notch in the lower margin. The scutal margin is decidedly longer than the tergal. Mucro at the scuto-tergal angle.

The rostrum is very small, subtriangular, lying between the umbones of the rostral latera.

The rostral lateral plate is quadrangular, nearly as high as wide, but with the basal margin shorter than the scutal. The lateral margin is convex.

The inframedian lateral is wineglass shaped, narrowest at the lower third. The upper portion is triangular, its upper face concave, against the upper latus, but one angle extends up, touching the scutum. The umbo is median. The base of the plate is expanded, forming a smaller triangle than the upper part.

The carinal latus is irregularly triangular, projecting a little beyond and below the carina. The two latera meet in a very short suture below the carina. Umbo slightly recurved at the base of the carina.

The peduncle is very short, with 10 rows of large scales, about 6 scales in a row.

Length of capitulum about 13.5, width 7 mm.; length of peduncle 5 mm.

The type-specimen was broken in the dredge across the terga and upper part of the scuta. The species is notable for the shape of the upper latus, which is unlike any known form of the same group. The very small, nodule-like rostrum, visible only between the apices of the rostral latera, is also highly characteristic.

A young example (fig. 16 *c*) occurred with the type and is here illustrated to show the changes which take place with age. The upper lateral plate is normal in shape, without the basal notch of the adult. This would be anticipated from observing the growth-lines of the latter. The rostrum is relatively better developed but formed as in the adult type. The inframedian lateral plate is somewhat less individualized than in the type. Length of capitulum 7, breadth 3.1 mm.

S. recurvitergum Gruvel, from near the Azores, is a closely allied form, differing by its strongly recurved terga, the somewhat differently shaped upper latus, and the hairy peduncle and carina. (Fig. 16.)

SCALPELLUM GRACILIUS, new species.

Type.—Cat. No. 32863, U.S.N.M.

Type-locality.—*Albatross* Station 2678, off Cape Romain, South Carolina, north latitude 32° 40′, west longitude 76° 40′ 30″, in 731 fathoms; bottom temperature 38.7°.

The capitulum is narrow, its length more than double the width; both ventral and dorsal margins are slightly convex; composed of 14 fully calcified plates; covered with a thin smooth cuticle. Sutures linear. The plates have slight growth lines, and a few barely perceptible radial striæ.

The scutum is fully twice as long as wide; the occludent margin convex, except near the base, where it is slightly concave. Lateral margin slightly sinuous, subparallel to the occludent margin. Basal margin passing into the lateral in a regular curve. The apex is a little incurved and acuminate.

The tergum is much longer and wider than the scutum, triangular. The occludent margin is slightly convex, basal margin straight, and the carinal margin is very weakly sigmoid, nearly straight. The apex is erect.

The carina is regularly curved, with the apex terminal. The roof is strongly and evenly convex, curving into the sides, which are rather

wide. The basal margin is convex. The lines of growth on the roof curve deeply downward.

The upper latus is irregularly pentagonal. The scutal margin is much the longest and straight; the tergal shorter and straight. The carinal margin and that against the carinal latus are still shorter, subequal. The basal margin, against the inframedian lateral plate, is very short. The apex is subterminal.

The rostrum is reduced to a linear rudiment, separating the rostral latera along the upper half of their contiguous borders.

The rostral latus is subtriangular, the three sides about equal. The scutal margin is slightly concave, the ventral margin straight, and the baso-lateral margin is convex.

The inframedian latus is oblong, narrow, contracted slightly below the middle, a little dilated above and below the contraction, the basal segment much smaller than the upper. The umbo is close to the base.

The carinal latus is very long and narrow, nearly as long as the scuta. The carinal margin is straight, the lateral and basal margins convex. The umbo is close to, but not at, the base of the plate, below the carina. It does not project beyond it. The two plates meet in a very short straight suture below the carina. The peduncle is very short, closely covered with large transversely lengthened scales, in six rows of about 5 scales each.

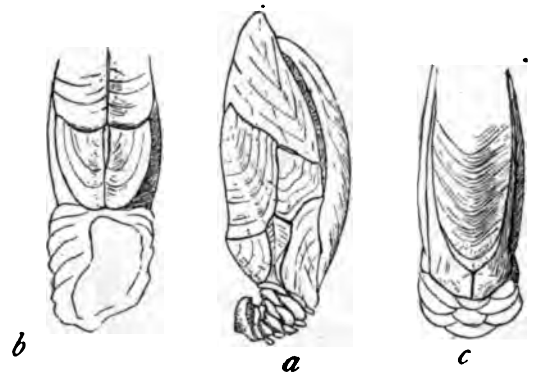


FIG. 17.—SCALPELLUM GRACILIUS. *a*, LATERAL VIEW × 5, WITH DETAILS OF, *b*, ROSTRUM AND, *c*, CARINA.

Length of the capitulum 8, breadth 3.3, mm.; length of the peduncle 1.8 mm.; length of the carina 6.3, diameter at base 1 mm.

The more conspicuous features of this small species are its excessively narrow rostrum, the rounded roof of the carina, the somewhat hour-glass shaped inframedian latera, and the very long and narrow carinal latera. Where the rostrum is so reduced as in this species, its complete elimination in some individuals would occasion little surprise. Only two specimens were taken, the second one being immature, about half the size of the type. They were seated upon a slender annelid tube.

S. gracilius is closely related to *S. novæzelandiæ* Hoek and *S. flavum* Hoek, both antipodal species. *S. novæzelandiæ* differs by having the carina flat-roofed. *S. flavum* is very close to *S. gracilius*, but

the rostral latus is smaller, the carinal latus decidedly wider, and the roof of the carina less rounded; yet were it not for the wide geographic separation of the two species I would be disposed to rank the North Atlantic species as a race or variety of *S. flavum*. Neither *S. novæzelandiæ* nor *S. flavum* has a rostrum.

S. novæzelandiæ has been reported from the Northeastern Atlantic by M. Gruvel,[a] who so identified three specimens taken by the *Travailleur* in north latitude 38° 8′, west longitude 12° 3′, in 2,400–2,500 meters. They differ in various minor details from Hoek's type. (Fig. 17.)

SCALPELLUM CARINATUM Hoek.

1883. *S. carinatum* HOEK, *Challenger* Report, Cirripedia, p. 76, pl. III, figs. 7, 8. Near Tristan da Cunha, 1,000 fathoms.

Localities.—Cat. No. 32872, U.S.N.M., *Albatross* Station 2731, off Cape Hatteras, north latitude 36° 45′, west longitude 74° 28′, in 781 fathoms, on *Scalpellum velutinum*. Also No. 32876, U. S. N. M., *Albatross* Station 2111, off Cape Hatteras, north latitude 35° 09′ 50″, west longitude 74° 57′ 40″, in 938 fathoms.

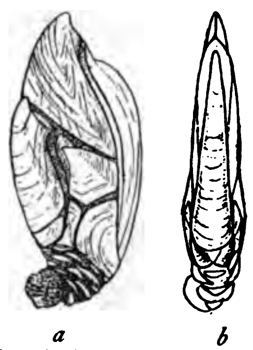


FIG. 18.—SCALPELLUM CARINATUM. *a*, LATERAL AND, *b*, CARINAL VIEWS × 5.

The specimens measure 9 and 11.5 mm. (No. 32872) and 7 mm. (No. 32876) in length of capitulum. The peduncle is very short and oblique. The tergum, in these American examples, is longer and narrower than in Hoek's figured type. The rostrum is represented only by a small nodule between the apices of the rostral latera in No. 32876, but I can see no trace of it in the two specimens from the other station. It is a rather stout little species, with the roof of the carina flat and rapidly widening. The individual from Station 2111 is figured, to show the features of the American form. (Fig. 18.)

SCALPELLUM PERLONGUM Pilsbry.

1907. *Scalpellum perlongum* PILSBRY, Bulletin of the Bureau of Fisheries, XXVI, p. 198, pl. VI, fig. 12.

Type.—Cat. No. 32420 U.S.N.M.

Type-locality.—Off Point Loma Lighthouse, near San Diego, California, in 639 fathoms.

[a] Exped. Sci. du Travailleur et du Talisman, Cirrhipèdes, p. 54, pl. II, figs. xii, xiii, xv.

SCALPELLUM ALBATROSSIANUM, new species.

Type.—Cat. No. 32891, U.S.N.M.

Type-locality.—*Albatross* Station 2226, off Cape Hatteras, north latitude 37°, west longitude 71° 54′, in 2,045 fathoms, on *Scalpellum regium*.

The capitulum is fully twice as long as wide, widest in the middle, tapering toward base and summit. The occludent margin is regularly arched, summit a trifle recurved. Composed of thirteen fully calcified plates, separated by very narrow chitinous sutures. The plates are distinctly marked with lines of growth, and covered with a thin, shortly and rather sparsely pilose cuticle.

The scutum is slightly more than twice as long as wide, its occludent margin regularly arcuate. The lateral margin is about two-thirds as long as the scutal. It is deeply sinuated, for the reception of the apex of the upper latus, just below the tergo-lateral angle, which is extended in a narrow acute lobe. The baso-lateral angle is rounded, and rests for a short distance against the inframedian latus.


FIG. 19.—SCALPELLUM ALBATROSSIANUM × 4.

The tergum is triangular, longer, and wider than the scutum. Occludent margin arcuate, basal margin straight, carinal margin weakly sigmoid, being concave above, convex below. The apex of the carina reaches its upper third. The apex is a trifle recurved.

The carina is strongly arched above, less so in the lower half. The umbo is apical, against but not between the terga. The roof is flat, bounded by very low, narrow ribs. The sides are wide in the upper half, narrow and tapering in the lower.

The upper latus is triangular in general outline, but with five facets. The scutal margin is longest, slightly concave; the tergal is a little shorter, a trifle convex. The carinal margin is about half as long as the scutal and a little shorter than the carino-lateral. The very short basal margin is in contact with the summit of the inframedian latus. The umbo is terminal, projecting into a recess in the scutum.

There is no rostrum.

The rostral latus is wider than high, with the umbo slightly projecting from the rostral margin. The straight basal margin curves into the lateral margin.

The inframedian latus is oblong, about three times as high as wide, with slightly raised central mucro, from which low ribs radiate to the angles of the plate. The upper end is truncated, and the base is a little [illegible]ated laterally.

The carinal latus is about twice as high as wide, with the umbo slightly projecting behind at the lower fifth of the carinal margin. The carinal margin is slightly concave above the umbo, convex below it. The lateral margin is nearly parallel with the carinal.

The very short peduncle is closely covered with rounded imbricating scales, in nine rows of about eight scales each.

Length of the capitulum 10.5, width 5.3 mm. Length of the peduncle 3.5 mm. Length of the carina 9, diameter at base 1.7 mm.

This species, represented by an unique example, stands close to *S. novozelandiæ* Hoek, but differs by the shape of the scutum. In *S. minutum* and *S. abyssicola* the carinal margin of the upper latus is longer. It resembles *S. idioplax* in the shape of the scutum, but the inframedian and upper latera differ. The American form of *S. carinatum* differs from *S. albatrossianum* by having the umbones of the carina and upper latus removed from the apices of these plates; and the typical *S. carinatum* further differs by the shape of the tergum. In ventral view *S. albatrossianum* resembles the Californian *S. perlongum* Pilsbry. (Fig. 19.)

GROUP OF SCALPELLUM AURIVILLII.

Inframedian latus very narrow, widest at the base, tapering to the acute apical umbo.

SCALPELLUM PENTACRINARUM, new species.

Type.—Cat. No. 32870, U.S.N.M.

Type locality.—*Albatross* Stations 2319–2350, off Habana, Cuba, on a pinnule of *Pentacrinus*.

The capitulum is subtriangular, the slightly convex occludent margin about twice the length of either of the other sides of the triangle. It is composed of thirteen plates, which are fully calcified, separated by linear sutures, and without perceptible cuticle. The plates are lilac tinted, nearly white near the occludent margin, marked with fine lines of growth and the scutum, tergum, and upper latus have also fine, low radial striæ.

The scutum is long and narrow, widest at the base, which occupies fully three-fourths the width of the capitulum at that place. The occludent margin is straight except near the summit, where it curves slightly inward. The long, straight lateral margin converges slightly upward toward the occludent, so that the plate is narrower at the tergo-lateral angle than at the base. The straight basal margin makes a right angle with the occludent margin. The acute apex is at the occludent margin. A low, narrow riblet runs from the apex to the baso-lateral angle.

The tergum is a little longer and wider than the scutum, triangular, with erect apex. The occludent margin is slightly convex. The

scutal and lateral margins are straight and subequal, meeting at an obtuse angle. The carinal margin is nearly straight.

The carina is unusually short, irregularly arched, having several straightened faces in its dorsal contour. The roof is rounded, passing directly into the narrow sides, and marked with faint transverse, arcuate growth-lines. The base extends triangularly between the carinal latera. The apex is terminal and incurved, but not intruded between the terga. It reaches only to the lower fourth of the carinal margin of the terga.

The upper latus is wedge-shaped. The scutal margin is straight and about twice the length of the straight tergal margin. The carinal margin is slightly convex. The umbo is terminal at the scuto-tergal angle, which is a little less than a right angle.

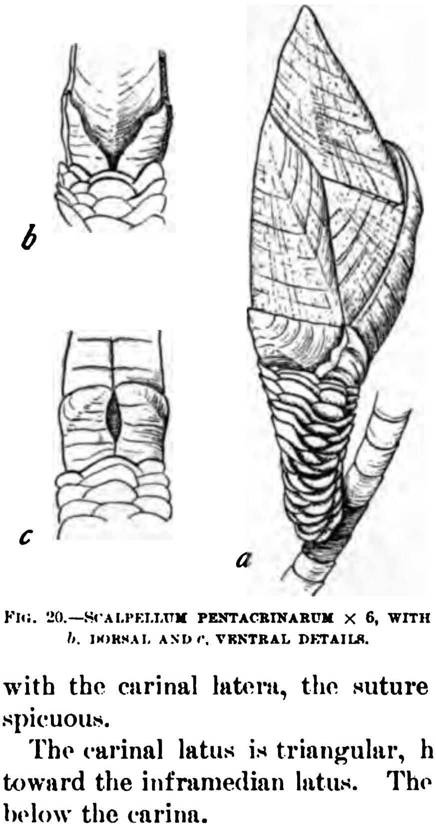


FIG. 20.—SCALPELLUM PENTACRINARUM × 6, WITH b, DORSAL AND c, VENTRAL DETAILS.

There is no rostrum, but a lanceolate space between the rostral latera is bridged with yellowish chitin.

The rostral latus is quadrangular, at least twice as wide as high. The basal margin is much shorter than the scutal and parallel to it. The rostral margin is concave, the lateral somewhat irregular. A low diagonal riblet divides the plate into triangular areas.

The inframedian latus is very narrow, sinuous, and as high as the adjacent latera, its umbo at the acute apex. It is apparently concrescent or partially so, with the carinal latera, the suture between them being very inconspicuous.

The carinal latus is triangular, higher than wide, the apex curved toward the inframedian latus. The two latera almost meet at the base below the carina.

The peduncle is covered with wide imbricating scales in six very distinct rows of about fifteen scales each. The scales of adjacent rows interlock only shortly.

Length of the capitulum 8, breadth 3.7 mm. Length of the peduncle 3.7 mm. Length of the carina 5.2, diameter near base 1.2 mm.

This peculiar little species resembles *S. balanoides* in the short carina and triangular upper latus, but the carinal latus is short, and

the carina reaches only to about the lower fourth of the carinal margins of the terga. The almost concrescent inframedian and carinal latera are a peculiar feature of the new form. At first sight inframedian latera seem to be wanting. (Fig. 20.)

SCALPELLUM MICRUM, new species.

Type.—Cat. No. 32879, U.S.N.M.

Type-locality.—*Albatross* Station 2668, between the Bahamas and Cape Fear, North Carolina, in 294 fathoms, on a delicate Hydroid, bottom temperature 46.3° F.

The capitulum is oval, widest in the middle, tapering toward both ends; the ventral and dorsal margins are about equally curved; compressed and white; composed of fourteen fully calcified plates, separated by linear sutures. There is no perceptible cuticle. The plates are faintly marked with lines of growth and a few very faint radial striæ.

The scutum is about twice as long as wide, the occludent and lateral margins parallel, the basal margin nearly at right angles to them. The upper third of the occludent margin bends backward. The umbo is acute, terminal, and recurved.

The tergum is wider and longer than the scutum, triangular. The occludent margin is convex; scuto-lateral margin convex. The carinal margin is sinuous, the upper part being concave, the lower somewhat convex.

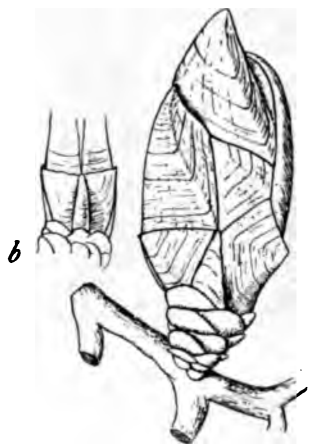


FIG. 21.—SCALPELLUM MICRUM × 8, WITH DETAIL VIEW OF ROSTRUM, *b*.

The carina is short, simply arched, with an apical mucro. The roof is rounded, passing directly into the narrow sides; it is transversely marked with deeply arcuate growth-lines. The apex reaches to the upper third of the length of the carinal margin of the tergum. The base is rounded.

The upper latus is trapezoidal with straight margins, the carinal margin nearly half as long as the scutal, the tergal and basal margins about equal. The apex is terminal at the scuto-tergal angle.

The well-developed rostrum forms a band about one-fifth as wide as long, and slightly narrower above than at the base. It extends the whole length of the adjacent latera.

The rostral latus is triangular, with the basal angle of the triangle truncated. The three sides are about equal, the two upper angles also equal.

The inframedian latus is narrow, triangular, its height equal to that of the rostral latus, and about double the basal width. The umbo is apical.

The carinal latus is irregularly pentagonal, widest above the middle, exceeding in area the upper and the rostral latera. The upper lateral and carinal facets are equal and straight, the lower lateral longer, straight, and the subcarinal margin still longer, concave. The basal margin is shortest. The umbo projects angularly beyond the carina. In dorsal aspect the two carinal latera are seen to meet below the carina in a straight suture as far up as their umbones.

The peduncle is very short, covered with large imbricating scales in five rows of four scales each.

Length of the capitulum 5, breadth 2.5 mm. Length of the peduncle 1.3 mm. Length of the carina 3.2 mm.

This minute form is notable for the length of the plates of the lower whorl, especially of the carinal latera, and for the shortness of the carina. It is closely related to *S. brevicarinatum* Hoek, but in that antipodal species the whole capitulum is more lengthened, the greatest breadth being decidedly less than half of the length. The tergum is longer, the rostral lateral narrower and wedge-shaped, and the subcarinal margin of the carinal latus is slightly convex. The roof of the carina in *S. brevicarinatum* is described as "not quite flat;" but in the present species it is strongly convex. *S. micrum* is known by a single individual, which occurred with *Scalpellum longicarinatum*. (Fig. 21.)

SCALPELLUM FORMOSUM, new species.

Type.—Cat. No. 8975, U.S.N.M.

Type-locality.—*Albatross* Station 2097, east from the mouth of Chesapeake Bay, north latitude 37° 56′ 20″, west longitude 70° 57′ 30″, in 1,917 fathoms, Globigerina ooze.

Other localities.—*Albatross* Station 2205, south of Marthas Vineyard, in latitude 39° 35′ north, U.S.N.M. Cat. No. 32897.

The capitulum is composed of 13 (or 14?) wholly calcified plates. Ventral margin convex. The plates are sculptured with low, widely spaced, narrow wrinkles or ridges in the direction of lines of growth, and fine, distinct, and close riblets radiating from the umbones. The cuticle is very thin and sparsely clothed with rather long delicate hairs. Sutures are linear.

The scutum is trapezoidal, more than half as wide as long. Occludent margin convex; tergal, lateral, and basal margins are straight, the basal shortest. There is a curved diagonal riblet from apex to baso-lateral angle, stronger than the other radii. The acute umbo lies slightly within the ventral margin.

The tergum is triangular, with almost perfectly straight sides. It is about 1½ times the length of the scutum and more than twice as long as wide.

The carina is evenly and strongly curved, with apical umbo. The roof is flat, bounded by narrow but rather high lateral ribs. The sides are wide and strongly sculptured with oblique riblets, which are a little irregular or crenulate. The basal margin is straight.

The upper lateral plate is quadrangular, the scutal and carinal margins straight and parallel. The scutal margin is more than twice as long as the carinal. The tergal and basal margins are straight, subequal, and shorter than the scutal. The umbo is terminal.

There seems to be a triangular rostrum, wholly covered by the rostral latera, but visible in the type-specimen by reason of the broken apices of these latera. The specimen being unique, could not be further investigated to make certain the actual conditions.

The rostral latus is trapezoidal, more than half as high as long. The ventral margins of the two plates are straight and in contact. The basal margin is quite short, and probably in part covered by the inframedian plate. The scutal margin is long and straight.

The inframedian latus is narrowly triangular, a little contracted near the obtuse apex. The basal margin is about half as long as the plate. The rostral and carinal latera are in contact for a very short distance above the inframedian plate.

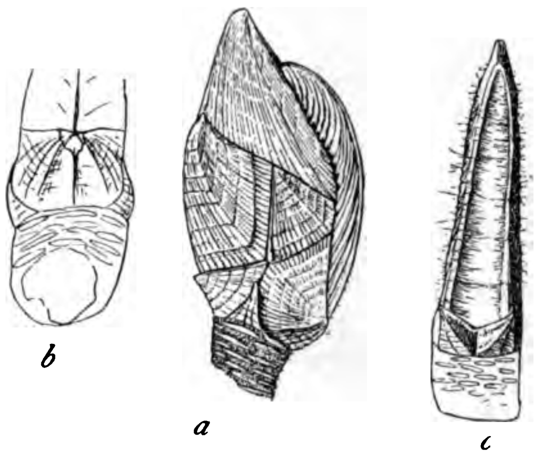


FIG. 22.—SCALPELLUM FORMOSUM × 3. *a*, LATERAL VIEW; *b*, DETAIL OF ROSTRUM; *c*, CARINAL VIEW.

The carinal latus is large and irregularly rhombic. The dorsal margin is curved and projects slightly from the dorsal outline below the base of the carina. The two plates meet below the carina in a straight suture. The umbo does not project and is situated at the base of the carina below the middle of the dorsal outline of the plate. Several beaded ribs radiate from the umbones to the lower and dorsal margins of the plates.

The very short peduncle is covered with narrow, transversely elongated scales, and clothed with a hairy cuticle.

Length of the capitulum 14, breadth 7.5 mm. Length of the peduncle 2.7 mm. Length of the carina 10.7, diameter at base 2.5 mm.

This handsomely sculptured species is represented by a single example from the type locality. It belongs to a group comprising *S.*

vitreum Hoek of the Pacific, *S. curvatum* Gruvel, *talismani* Gruvel, and *S. rigidum* Aurivillius of the northeast Atlantic (Azores to the Gulf of Gascony). *S. formosum* stands nearest *S. talismani*, but differs by the longer inframedian lateral plate (which in *talismani* is in form of an isoceles triangle), the lower rostral latera, and the somewhat different sculpture of the carinal latera.

From Station 2205 only the detached valves of a macerated specimen are preserved. It is larger than the type, the carina measuring 18.5 mm. long, 3.3 wide. The sculpture is very sharp and beautiful. The dorsal faces of the carinal latera are radially tricostate. (Fig. 22.)

SCALPELLUM GRACILE, new species.

Type.—Cat. No. 32908 U.S.N.M.

Type-locality.—*Albatross* Station 2791, off Chile, south latitude 38° 08′, west longitude 75° 53′, in 677 fathoms; bottom temperature, 37.9° F.

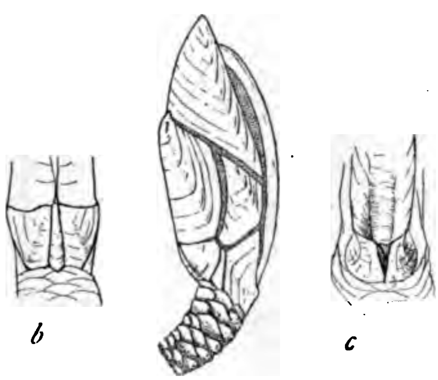


FIG. 23.—SCALPELLUM GRACILE × 4, WITH *b*, DETAILS OF ROSTRUM, AND *c*, CARINA.

The capitulum is slenderly oval, widest in the middle, the ventral and dorsal borders equally curved, base narrow. It is composed of 14 wholly calcified plates, the upper lateral plates and carina separated by chitinous spaces from the others. Cuticle very thin and smooth. Most of the plates show very faint radial striation.

The scutum is wider at and above the middle than toward the base. The occludent margin is straight except near the apex, where it curves inward. The lateral margin is somewhat convex. The umbo is at the acuminate apex, which overlies the adjacent angle of the tergum.

Tergum longer than the scutum, triangular, the occludent and basal margins about equal in length, the former convex, the latter straight. The carinal margin is straight. Apex erect.

The carina is long and evenly arched, with apical umbo. The roof is convex, between two high lateral ribs. The sides are narrow, but widest near the apex.

The upper lateral plate is about as wide as the scuta, quadrangular, with the scutal and carinal borders parallel, the carinal about half as long as the scutal; basal and tergal margins are straight and about equal in length. The umbo is acute and apical.

The rostrum is very narrow and long, a trifle wider toward the base. It separates the rostral latera throughout.

The rostral latus is quadrangular, about as high as wide. The basal margin is much shorter than the scutal, the rostral and lateral margins subequal and diverging upward. The scuto-lateral angle is truncated and rests against the upper latus.

The inframedian latus is extremely narrow, almost linear. The upper end curves slightly toward the scutum, and the base is a trifle widened. The umbo is not distinct, but presumably apical.

The carinal latus is shaped like the upper latera, much higher than wide. The carinal margin is double the length of the scutal and parallel to it. At its lower fourth the umbo projects slightly beyond the carina. The basal and upper margins are very oblique and straight.

The peduncle is short, with about eight rows of six large, transversely lengthened scales each.

Length of the capitulum 9.5, breadth 3.5 mm.; length of the peduncle, 2.3 mm. Length of the carina 7.5, diameter at base 1 mm.

This slender and graceful species resembles *S. planum* Hoek, a species without a rostral plate. It is also somewhat like *S. brevicarinatum* Hoek, but in that the carinal latera differ widely. A single specimen was taken. (Fig. 23.)

SCALPELLUM ANTILLARUM, new species.

Type.—Cat. No. 9682 U.S.N.M.

Type-locality.—*Albatross* Station 2384, Gulf of Mexico, north latitude 28° 45′, west longitude 88° 15′ 30″, in 940 fathoms; bottom temperature, 39.6° F.

The capitulum is long-oval, widest in the middle, tapering toward both ends; composed of 13 or 14 wholly calcified plates. The occludent and dorsal margins are about equally convex. The very thin cuticle is somewhat hairy on the carina, sutures, and peduncle. The plates are sculptured with widely spaced wrinkles in the direction of growth-lines, and there are some extremely faint radial striæ.

The scutum is irregular in shape, the lower half wider than the upper. Occludent margin convex; lateral margin weakly sigmoid. The basal margin is straight, and the apex acuminate and a little recurved, overlying the lower angle of the tergum.

The tergum is triangular, a little longer than the scutum, with nearly straight margins and an erect apex.

The carina is long and evenly arcuate, with apical umbo. It extends between the carinal latera to the peduncle. The roof is flat, bounded by acute angles, which toward the upper part project a little, forming narrow marginal ribs. The sides are narrow.

The upper latus is obliquely spatulate, the scutal margin longest, concave; tergal margin straight. Carinal margin shorter than that against the carinal latus. The basal point is directly above the infra-

median latus. The inconspicuous umbo is at the upper fourth, in the narrow portion of the plate.

The rostrum is represented by a linear vestige almost concealed in the cuticle.

The rostral latera are subquadrate. The occludent and scutal margins are straight, nearly equal, and at right angles. The basal margin is not much more than half as long as the scutal; and the lateral margin is weakly sigmoid.

The inframedian latus is small, narrowly triangular, about half the height of the rostral latera. The basal margin is scarcely half the total length of the plate. Umbo at the obtuse apex.

The rostral latus is twice as high as wide, with four unequal sides, no two of them parallel. The umbo is at the lower sixth of the straight carinal margin, and hardly projects beyond the carina. The carinal margin is longest, basal and lateral short and nearly equal. The upper angle is acute.

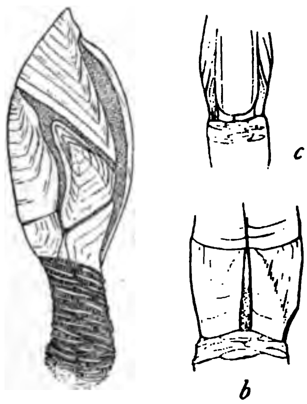


FIG. 24.—SCALPELLUM ANTILLARUM × 3, WITH DETAILS OF *b*, ROSTRUM AND *c*, CARINA.

The peduncle is very short, with about eight rows of eight transversely lengthened, narrow scales each, the intervals hairy.

Length of capitulum 11, breadth 5.7 mm. Length of peduncle 4.5 mm. Length of the carina 10, diameter at base 1.1 mm.

There is some uncertainty about the number of plates, since the rostrum is so inconspicuous that it may readily be overlooked. When so reduced as in this species it is likely to be absent in some individuals.

A single example was taken. The peculiar shape of the upper latus and the very long carina, which passes between and entirely separates the carinal latera, are its more conspicuous features. (Fig. 24.)

SCALPELLUM SEMISCULPTUM, new species.

Type.—Cat. No. 9888, U.S.N.M.

Type-locality.—*Albatross* Station 2397, Gulf of Mexico, north latitude 28° 42′, west longitude 86° 36′, in 280 fathoms, gray mud.

The capitulum is about twice as long as wide, widest at the middle, the occludent margin nearly or quite as much arched as the carinal; composed of 13 fully calcified plates joined by linear sutures. The cuticle is very thin and smooth. The plates are marked with lines of growth and fine, inconspicuous radial striæ, but the carinal latera have distinct and strong radial riblets.

The scutum is about twice as long as wide, rhomboidal, with acute apical umbo. The occludent and lateral margins are subparallel and somewhat convex. The tergal margin is concave, the basal straight.

The tergum is triangular, conspicuously larger than the scutum. The occludent margin is about three-fourths as long as that of the scutum and is strongly arched, the acute summit being thus somewhat recurved. The scutal margin is a little longer than the occludent; the carinal margin is a little hollowed near the apex, elsewhere convex.

The carina is long and equably curved, its apical umbo at about the upper fourth of the carinal margin of the tergum. The roof is flat

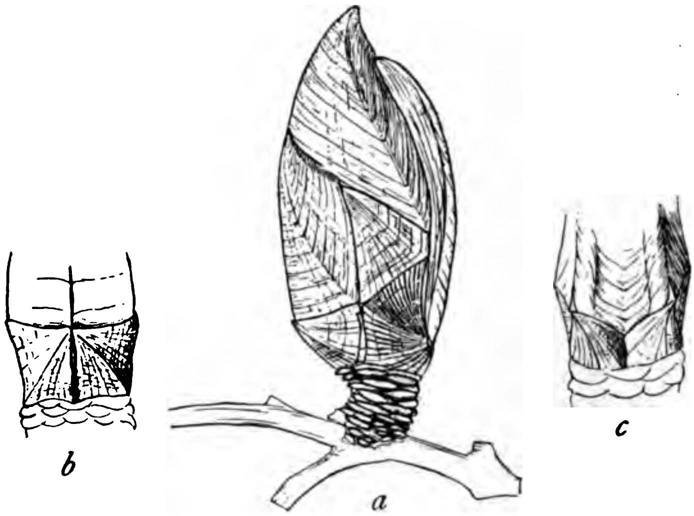


FIG. 25.—SCALPELLUM SEMISCULPTUM × 3, WITH DETAILS OF ROSTRUM *b*, AND CARINA, *c*.

between low but strong bordering ribs. The sides are narrow below, wider above; basal margin convex.

The upper latus is trapezoidal, the scutal margin concave, carinal margin very short, about one-third the length of the scutal. The tergal and basal margins are about equal and straight. The umbo is terminal; a narrow rib runs from it to the baso-carinal angle. The plate is finely, rather sharply striate radially.

There is no rostrum, or merely a sunken linear rudiment. The rostral latus is as high as wide, the basal margin very much shorter than the others; scutal margin straight, horizontal. The umbo projects a little at the upper occludent angle. From it a narrow diagonal rib runs to the lower lateral angle, the surface below this rib being radially striate. The two rostral latera rise in a low welt or irregular ridge at their occludent suture.

The inframedian latus is very narrow, almost linear, and about as long as the adjacent border of the rostral latus. It curves above

slightly toward the rostral border. The umbo is probably apical, but it is not readily visible.

The carinal latus is irregularly trapezoidal, perhaps a little greater in area than the upper latus. The basal and lateral margins are about equal, the oblique upper margin a little longer. The obtuse umbo is at about the lower third of the carinal margin. It does not project beyond the carina. The plate is sculptured with strong radial riblets. In dorsal view the carinal latera are seen to be strongly tricostate, and meet in an irregular suture.

The peduncle is very short, closely covered with large, projecting, transversely lengthened scales, in about eight rows of eight scales each.

Length of the capitulum, 16; breadth, 7.7 mm. Length of the peduncle, 3 mm. Length of the carina, 12.5; diameter at base, 2.5 mm.

The linear inframedian latus and the strong radial sculpture of the carinal latus are the more striking characters of this species. It is most nearly related to *S. aurivillii*, but differs in numerous particulars, as set forth in the key to species. (Fig. 25.)

SCALPELLUM AURIVILLII, new species.

Type.—Cat. No. 32865 U.S.N.M.

Type-locality.—*Albatross* Station 2731, off Cape Hatteras, north latitude 36° 45′, west longitude 74° 28′, in 781 fathoms, growing on *Scalpellum velutinum*.

Other localities.—No. 12286, *Albatross* Station 2728, north latitude 36° 30′, west longitude 74° 33′ in 850 fathoms. No. 11757, *Albatross* Station 2710, north latitude 40° 06′, west longitude 68° 01′ 30″, in 984 fathoms. No. 9026, Fish Commission Station 1123, off Marthas Vineyard, 787 fathoms, bottom temperature 39° F., on *Acanella*. No. 10779, *Albatross* Station 2529, north latitude 41° 03′ 30″, west longitude 66° 14′, in 662 fathoms, gray mud, bottom temperature 38.7° F.

The capitulum is rhombic-oblong, twice as long as wide, the ventral margin slightly convex; composed of 13 fully calcified plates. Cuticle very thin and smooth. Sutures linear. The plates are marked with fine, irregular lines of growth, and minute, inconspicuous radial striæ.

The length of the scutum is somewhat more then twice its greatest width. The occludent margin is straight except near the apex, where it bends back. The lateral margin is concave below the tergo-internal angle, becoming convex in the middle. The basal margin is nearly straight, and forms an angle slightly less than a right angle with the occludent margin. The plate is widest in the middle. The acute apex is recurved within the ventral border.

The tergum is much longer and wider than the scutum, triangular. The occludent margin is convex, nearly three-fourths as long as the

straight scutal margin. The carinal margin is very weakly sigmoid, concave above, convex below. The umbo is a trifle recurved.

The carina is simply arched, more strongly so above; umbo terminal. The roof is flat with distinct bordering ribs. The sides are moderately developed near the umbo, but very narrow elsewhere. The basal margin is straight, as are the fine lines of growth across the roof.

The upper lateral plate is trapezoidal, the scutal margin much the longest, concave. The other margins are straight, the carinal shortest, less than half as long as the scutal. The apex is produced in a small triangle above and beyond the umbo, which is acute and marginal, on the scutal side.

There is no rostrum.

The rostral latus is quadrangular, about as high as wide. The ventral and scutal borders are straight, the basal very short. The upper

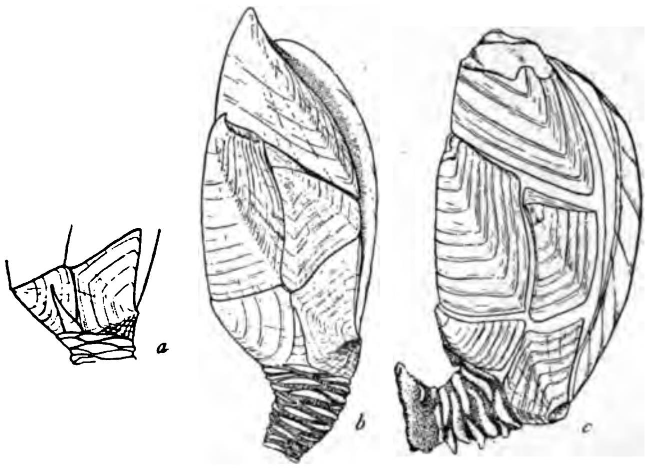


FIG. 26.—SCALPELLUM AURIVILLII. *a*, *b*, LATERAL VIEWS × 3; *c*, S. AURIVILLII, INCERTUM LATERAL VIEW × 2.

interior angle is truncated where it comes in contact with the upper latus for a short distance. The carinal margin is in contact with the carinal latus, but the suture is more or less covered by the extremely narrow inframedian latus, which overlies the borders of the plates.

The inframedian latus is very narrowly triangular, being wider at the base. The umbo is apical. It overlies the suture instead of occupying a space between the rostral and carinal latera. It is often abnormal, as noted below.

The carinal latus is twice as high as wide, quadrangular, the umbo at its lower third not projecting beyond the carina. The basal and rostral margins are subequal, straight, and at right angles. The carinal margin is nearly straight, projecting a little in the lower third.

The two latera meet below the carina. From the umbo a conical, raised, and radially costulate area extends to the basal margin.

The peduncle is very short, compactly covered with narrow transversely elongate scales, in eight rows of about eight scales each.

Length of the capitulum 15.3, breadth 7.5 mm. Length of the peduncle 5 mm. Length of the carina 13.5, diameter at base 2.2 mm.

The mandible (Plate V, fig. 15) has four teeth, unequally spaced, the lowest one ending in a group of about five small spines. The maxilla has a pair of stout spines at the upper angle, the face notched below them, with a double row of spines.

The first cirrus has unequal rami of eight and nine segments, those of the anterior ramus wider and shorter. It is densely hairy. The second cirrus is like those following, but a little shorter. The sixth cirrus has segments with four pairs of spines, the anterior one in each pair longer. The upper or distal group on each segment usually has three large spines instead of two. The posterior side has a pair of spines at the distal angle, one large, the other small, and on the outer cirrus there is a spine nearly midway between sutures. Fig. 9 of Plate IV represents an intermediate segment from the outer ramus of the sixth cirrus, the anterior side toward the right.

The caudal appendage (Plate IV, fig. 13) consists of five long segments and terminates in a group of three very long spines and one or two small ones. Length including spines is about 2.8 mm.

This species is related to *S. talismani* Gruvel and its allies, but differs by the very weak or hardly noticeable radial sculpture. Its nearest relative is *S. semisculptum*, a form in which the entire carinal latus is radially sculptured, and the carina has wider sides, stouter lateral ribs, and angular, V-shaped striæ on the roof.

Nine individuals from five stations between Cape Hatteras and Marthas Vineyard are in the collection. One of three in the type lot has the inframedian latera on both sides bent strongly towards the ventral margin, over the rostral latera (fig. 26 *a*). In another example, from Station 2728, these latera are bent towards the dorsal border, overlying the carinal latera. It would seem that, since these plates are crowded out of their normal place, their growth is likely to be uneven, and a large proportion of abnormal individuals results.

The largest individual has a capitulum 18 mm. long (Station 2728); but this size is attained at no other station, and some apparently mature capitula are only 12 mm. long.

This species is named for C. W. Aurivillius, author of an excellent paper upon North Atlantic, Arctic, and Oriental cirripedes. (Fig. 26*a*, *b*.)

SCALPELLUM AURIVILLII INCERTUM, new subspecies.

A single example (Cat. No. 32871, U.S.N.M.), evidently very closely related to *S. aurivillii*, was found growing on the peduncle of one of a series of *S. regium* var., said to be from *Albatross* Station 3342, off British Columbia, in 1,588 fathoms. Having been preserved probably in formaldehyde, the apices of the valves are more or less eroded, especially those of the terga. Allowing for this the length of the capitulum would be 24, breadth 13.5 mm.; length of the peduncle 7.5 mm. Length of the carina 22, diameter at base 3 mm. The plates are pale cream-colored, smoothish, except for narrow, widely spaced growth-arrest marks. On the roof of the carina the growth lines arch downwards. The upper latus is larger than in *S. aurivillii*, its length being twice the breadth, and its carinal margin is decidedly longer than in *S. aurivillii*. On the right side of the capitulum there is no inframedian latus and no indication that there ever was one, and on the left side only a small basal triangular plate; but the absence of these plates may be due to the action of the formalin, though I can not positively affirm that this is the case. The rostral latus is comparatively lower and wider, its greatest height only half the width. No rostrum. In other characters of the plates there is no important divergence from *S. aurivillii*, except for the size, which is much greater than that of any of the series of apparently adult examples of that species. (Fig. 26 *c*).

The mandible (Plate V, fig. 3) has teeth more slender than those of *S. aurivillii*, the lower point slenderer, with a group of about eight very minute points or spines.

The maxilla (Plate V, fig. 9) has a pair of stout upper spines, a notch below them. The other spines are shorter and not very numerous.

The first cirrus has unequal rami of eight and eleven segments. The other cirri do not differ materially from those of *S. aurivillii*. The terminal appendage is about as long as in *S. aurivillii* (the individual being much larger), and seems to consist of but three segments, the last terminating in two long spines and one short one.

SCALPELLUM GALAPAGANUM, new species.

Type.—Cat. No. 32864, U.S.N.M.

Type-locality.—*Albatross* Station 2808, off the Galapagos Islands, south latitude 00° 36′ 30″, west longitude 89° 19′, in 634 fathoms, bottom temperature 39.9°.

The capitulum is long and slender, the length more than double the breadth; much compressed. The ventral margin is nearly straight from base to apex of the tergum. It is composed of 13 (or 14, count-

ing the excessively rudimentary rostrum) fully calcified plates, which are smooth except for faint growth lines and very inconspicuous radial striæ. Cuticle hardly perceptible, smooth. Sutures linear.

The scutum is more than twice as long as wide, with slightly convex occludent and lateral margins. It is widest at the middle. The basal margin is at right angles to the occludent. The tergal margin is very oblique.

The tergum is triangular, conspicuously longer than the scutum and much greater in area. Its occludent and basal margins are subequal and straight. The upper half of the carinal margin is straight, the lower half convex. The apex is erect.

The carina is long, rather strongly arched in its upper half, less so in the lower half.

The umbo is apical. The roof widens rapidly downwards; at first, near the apex, it is convex, but it soon becomes flat, and even a trifle concave near the base, with bluntly angular borders. The sides are quite wide in the apical third, but very narrow and a little turned in in the lower two-thirds. The basal margin is convex.

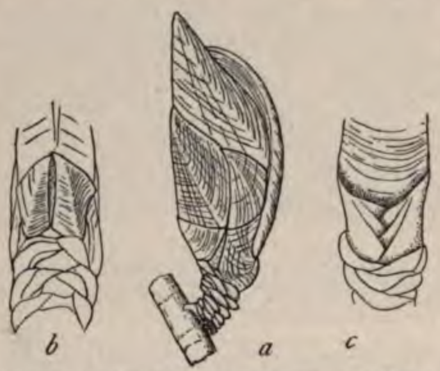


FIG. 27.—SCALPELLUM GALAPAGANUM. *a*, LATERAL VIEW, × 4, WITH *b*, DETAILS OF ROSTRUM, AND *c*, CARINA.

The upper lateral plate is quadrangular, the scutal margin longest, concave, the beak or umbo at its upper end encroaching a little upon the scutum. The tergal margin is a trifle convex, and slightly longer than the carinal. The basal angle of the upper lateral plate meets the baso-lateral angle of the scutum, and the upper interior angles of the rostral, inframedian and carinal latera; the sutures all radiating from a common center.

The rostrum in most examples (as in the figured type) is a distinct linear plate, clearly visible, though very narrow. In some examples it is hardly to be made out. The rostral latus is about as high as wide, quadrangular, the ventral and lateral margins nearly equal and diverging upwards, the basal very short, about half the length of the others, the scutal margin longest, slightly concave. The umbo has a tendency to project slightly at the ventral border.

The inframedian latus is as long as the adjacent border of the rostral latus, extremely narrow, wider at the base. Umbo at the apex.

The carinal latus is long and narrow, its length fully twice the width. The upper half of the carinal margin is straight, where in contact with the sides of the carina; the lower half is convex, project-

ing beyond the carina, the umbo being at the junction of the straight and convex portions. The other three facets of the plate, resting respectively against the peduncle, the inframedian latus and the upper latus, are straight and about equal. Posteriorly the two carinal latera are tricostate below the base of the carina, meeting there in a zigzag suture.

The peduncle is very short, conic, and covered with large imbricating scales, in eight rows of five or six scales each.

Length of the capitulum 9, breadth 3.5 mm. Length of the peduncle 1.5 mm. Length of the carina 7.2, diameter at base 1.4 mm.

This little species is narrower than any closely related forms. *S. gracile* has a much better developed rostrum, the occludent border is convex, and the carina differs. The very narrow inframedian lateral plate and the peculiar shape of the carina are also characteristic. A colony of eight individuals, three of them young, was grouped upon a slender stem, perhaps of a gorgonian. (Fig. 27.)

VI. Section **NEOSCALPELLUM**, new section.

Plates of the capitulum only partially calcified, the calcareous portion of the tergum V-shaped; inframedian latus narrow, higher than wide; scutum with apical umbo. Type, S. dicheloplax.

This section was established by Hoek in his memorable Challenger Report, though it was not named at that time.

The primary division in his key into species with the lower whorl of plates perfectly, and those with them imperfectly calcified is faulty, since it would separate immature from adult forms of the same species. (See *S. larvale* on page 78.) It remains to be seen whether the group is a natural one or whether it consists of species derived from several phyla. A comparative study of series of young individuals may throw light upon this inquiry, since these retain an earlier form of the plates. Hoek found the complemental males of *Scalpellum marginatum* (a species falling into the first division of my key) more degenerate than those of *S. intermedium*, a species of my second division.

S. inerme Annandale is certainly not related to species of either division of this section. It represents a parallel line of differentiation from *S. stearnsii* Pilsbry, as Hoek has already recognized. Imperfectly calcified species occur in other phyla, such as *S. patagonicum*, belonging to *Scalpellum s. str.*, and *S. giganteum*, a species of *Holoscalpellum*.

KEY TO SPECIES.

a. Carina with the narrow roof deeply guttered between high lateral ribs; the other plates with the calcified portions biramose or triramose (group of *S. dicheloplax.*)

b. Scutum bifurcate at the base. Pacific .... *S. phantasma.*

bb. Scutum entire basally. Atlantic............................*S. dicheloplax.*

aa. Carina with the roof flat or but slightly concave; rostral latera narrow and simple.

b. Umbo of the carina close to the apex; upper latus narrow, irregularly lunate; scutum without a tergal calcified branch, the base bifurcate. Pacific coast. *S. larvale.*

bb. Umbo of the carina close to the apex; upper latus Λ-shaped; lateral plates of the lower whorl triangular, the inframedian latus very small. Japan. *S. nipponense.*

bbb. Umbo of the carina at the upper third or fourth of the plate; upper latus wide, spatulate or subtriangular; scutum entire basally; inframedian latus very narrow.

c. Umbones of carina and carinal latera prominently projecting. Atlantic. *S. imperfectum.*

cc. Umbones of carina and carinal latera hardly modifying the dorsal contour. Pacific coast.......................................*S. sanctæbarbaræ.*

GROUP OF SCALPELLUM DICHELOPLAX.

SCALPELLUM DICHELOPLAX, new species.

Type.—Cat. No. 11951, U.S.N.M.

Type-locality.—*Albatross* Station 2711, north latitude 38° 59′, west longitude 70° 07′, in 1,544 fathoms.

Other localities.—No. 32862, Station 2222, north latitude 39° 03′ 15″, west longitude 70° 50′ 45″, in 1,537 fathoms, bottom temperature 36.9°. Nos. 8030, 8631, *Albatross* Station 2221, north latitude 39° 05′ 30″, west longitude 70° 44′ 30″, 1,525 fathoms, bottom temperature 36.9°.

The capitulum is irregularly ovate and strongly compressed, composed of 13 very imperfectly calcified plates. The occludent and carinal margins are strongly and about equally convex. The plates are all biramose or V-shaped, with the exception of the carina. The cuticle is smooth, without pubescence or hairs.

The scutum has a wide convex occludent and a very narrow, curved tergal calcified segment. The former is widest at the base, tapering to about one-third that width in the upper portion. The surface is sculptured with low, narrow, widely spaced riblets parallel to the basal margin. The occludent margin is strongly convex; the umbo is terminal at the apex, which is recurved within the ventral outline and overlies the base of the tergum.

The tergum is V-shaped, having a curved occludent branch about twice as wide as the long, slender, and curved carinal branch. This is nearly twice the length of the occludent branch. The apex is acute and somewhat recurved.

The carina is strongly arched, more so above. The umbo turns inward, but is not quite terminal, a flattened continuation of the sides extending beyond it. The roof is very deeply channeled, with high,

narrow bordering ribs. The sides are rather narrow and of nearly equal width throughout.

The upper lateral plate is irregularly hexagonal, with the calcified portion broadly V-shaped, the two branches nearly equal, somewhat curved. A narrow appendage or third branch arises at the apex and runs toward the tergum in a direction at a right angle to the tergal branch.

There is no rostrum.

The rostral lateral plate is V-shaped, the basal branch of the V being shorter and wider.

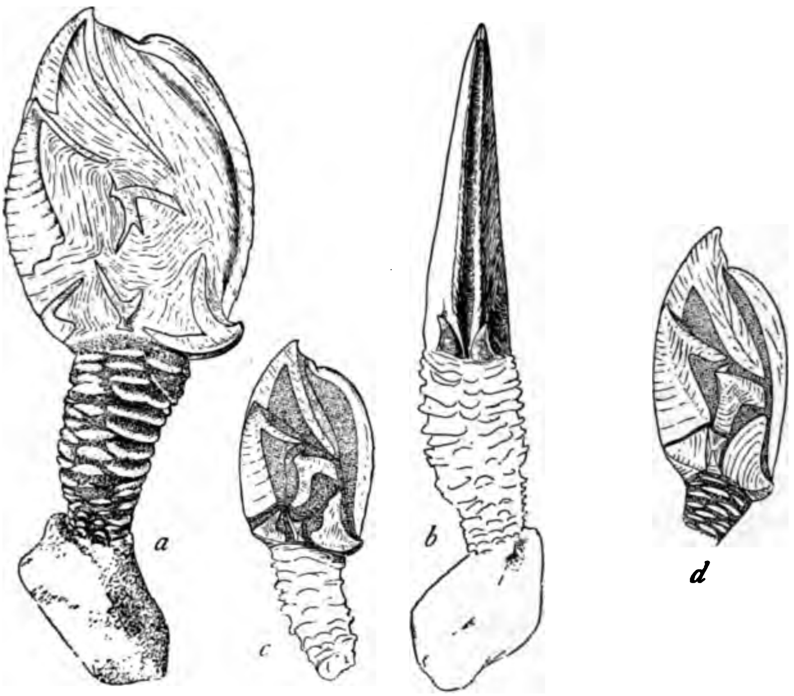


FIG. 28.—SCALPELLUM DICHELOPLAX. *a*, *b*, LATERAL AND CARINAL VIEWS OF THE TYPE, NATURAL SIZE; *c*, YOUNG INDIVIDUAL, NATURAL SIZE; *d*, S. DICHELOPLAX BENTHOPHILA × 2.

The inframedian latus is quadrangular. The rostral border is longest, a little concave near the base, convex above. The upper angle rests against the scutum. The oblique upper margin is a little concave, larger than the basal margin, and about the same length as the carinal. The straight basal margin is fully half as long as the rostral. The carinal margin is a trifle concave. The calcified portion is somewhat wineglass-shaped, being very narrow below the middle. The base is a little expanded, and the upper part composed of two diverging branches, that toward the scutum longer. The umbo is at or below the lower fourth in the adult stage, but higher in the young.

The carinal latus is broadly V-shaped, the carinal branch of the V larger and curved. The umbones are recurved and project below and beyond the carina.

The peduncle is shorter than the capitulum, clothed with very large, strongly projecting scales in seven rows of about twelve scales each.

Length of capitulum 44, width 31 mm.; length of peduncle, 24 mm.; length of the carina 42, diameter at base 4.5 mm. (Fig. 28*a*, *b*.)

A half-grown individual from the type lot is figured to show the true forms of the plates, the sutures between the chitinous, uncalcified bordering portions being visible as white lines at this stage of growth. In the drawing these sutures are represented by black lines. The original outlines of the plates approach the contours of species of the *S. scalpellum* group. (Fig. 28*c*.)

The oldest specimen of the type lot measures—length of capitulum 43, of peduncle 34 mm. The peduncle has seven rows of about seventeen scales each.

This is the largest of the imperfectly calcified species of *Scalpellum*. It is remarkable for the great reduction of the plates and their peculiar forms. It is related to *S. marginatum* Hoek, from off New Guinea, but the plates are more reduced, the upper latera have a different shape, and all the plates of the lower whorl differ somewhat in the two species.

Scalpellum edwardsi Gruvel, described from a single specimen dredged by the *Talisman* near the Azores in 4,255 meters, stands close to *S. dicheloplax*, and further collections are needed to fully elucidate their relations. The unique type of *S. edwardsi* has a capitulum 25 mm. long. The plates of the lower whorl are completely calcified, while the scuta, terga, and upper latera are like those plates in *S. dicheloplax*. In the smallest specimen of *S. dicheloplax*, capitulum 28 mm. long, the lower plates are almost wholly calcified (fig. 28*c*), approaching the condition of *S. edwardsi*; but the umbo of the inframedian lateral plate is situated higher. The chief difference is in the shape of the inframedian lateral plate. In *S. edwardsi*[a] the upper margin of this plate is longest, concave, and the basal part of the plate is extremely narrow—quite unlike the shape in *S. dicheloplax*. Moreover, the carina of *S. edwardsi* is described as with a flat roof bordered by two distinct but not very pronounced lateral ridges, and with the sides especially well developed in the upper part, while in the young as well as the adult *S. dicheloplax* the roof has a deep concave channel between two very high bordering ribs, and the sides are not wider above than elsewhere.

Whether the type of *S. edwardsi* is an adult form, and if not, what subsequent changes take place, are questions remaining to be ascertained. It is evidently distinct specifically from *S. dicheloplax*.

[a] Expéd. Sci. du Travailleur et du Talisman, Cirrhipèdes, p. 63.

Compared with *S. phantasma*, of California, it is seen that *S. dicheloplax* at no stage of growth has the base of the scutum bifurcate, the umbo of the carinal latus is recurved, and all the plates of the lower whorl differ somewhat in shape, the upper calcified rami of the rostral and carinal latera ascending less than in *S. phantasma.*

SCALPELLUM DICHELOPLAX BENTHOPHILA, new subspecies.

Type.—Cat. No. 32878, U.S.N.M.

Type-locality.—*Albatross* Station 2042, north latitude 39° 33′, west longitude 68° 27′, between Cape May and Nantucket, 1,555 fathoms.

The capitulum is more lengthened than in *S. dicheloplax*, its length twice the breadth. The carina is less arcuate with wider sides, and separated from the tergum by a much narrower chitinous suture. The plates of the lower whorl are completely calcified, and the inframedian lateral plate is narrower, with central umbo. The scuta, terga, and upper lateral plates are V-shaped, with comparatively shorter, wider branches than in *S. dicheloplax.* (Fig. 28*d.*)

Length of capitulum 15, width 7.5; length of peduncle, 4.5 mm.

The much more extensive calcification of the plates in the single example of this subspecies, as compared with *S. dicheloplax*, may be due to youth; but the narrower shape of the whole capitulum, the narrower inframedian latera, and the reduction of the chitinous space between carina and tergum are features which render it advisable to distinguish this form by name. It requires comparison with specimens of *S. dicheloplax* of equally small size, which are unfortunately not yet in our possession.

SCALPELLUM PHANTASMA Pilsbry.

1907. *S. phantasma* Pilsbry, Bulletin of the Bureau of Fisheries, XXVI, p. 194, pl. vi, fig. 1.

Type-locality.—Off Santa Catalina Islands, California, 2,196 fathoms.

GROUP OF SCALPELLUM NIPPONENSE.

SCALPELLUM NIPPONENSE, new species.

Type.—Cat. No. 32909, U.S.N.M.

Type-locality.—*Albatross* Station 3697, off Manazuru-zaki, Japan, between 120 and 265 fathoms.

The capitulum is elliptical, the length more than double the breadth, with both ventral and dorsal margins convex; covered with a very thin, smooth cuticle. It is composed of 13 imperfectly calcified plates, which are lightly marked with growth lines.

The scutum is subtriangular, the length nearly 2½ times the greatest breadth. The occludent margin is somewhat convex. The summit is acuminate, a little recurved, and overlies the base of the tergum.

Near the apex on the lateral side there is a small rounded lobe; elsewhere the lateral margin is nearly straight. The basal margin is straight and oblique.

The calcified portion of the tergum is V-shaped, the occludent branch six-tenths the length of the carinal, which is much longer than the scutum, and acute distally. The apex is erect and acute.

The carina is evenly arcuate, with subterminal umbo. The roof is flat, bounded by angles. The sides are narrow, a trifle wider near the apex.

The calcified portion of the upper lateral plate is V-shaped, the tergal branch about two-thirds as long as the scutal. Both branches are rounded distally. The scutal margin is noticeably concave near the apex. The umbo is acute, curved toward the scutum, and a small rounded calcified lobe extends beyond it.

FIG. 29.—SCALPELLUM NIPPONENSE. LATERAL VIEW, × 3.

There is no rostrum.

The rostral latus is wedge-shaped, narrower ventrally, about twice as long as high.

The inframedian latus is minute, narrowly triangular, with apical umbo.

The carinal latus is triangular, the basal margin straight, shorter than the others. The lateral margin is concave, the carinal margin nearly straight. The umbo projects a trifle backward and laterally, at the baso-carinal angle of the plate, and against the base of the carina.

The peduncle is short, with eight rows of about eight narrow and transversely elongated, non-imbricating scales.

Length of the capitulum 15, breadth 7.3 mm.; length of peduncle 6 mm.; length of the carina 13.5, diameter at base 1.7 mm.

Of this species a single specimen was taken. It is related to *S. japonicum* Hoek, but differs conspicuously by the shapes of the upper and the inframedian lateral plates, and the much narrower carina, as seen in dorsal view, the basal width of the roof being only about one-eighth of its length. Moreover, the summits of the terga are recurved in *S. japonicum*, erect and nearly straight in *S. nipponense*. *S. intermedium* Hoek, from the South Pacific, described from a specimen with the capitulum 9 mm. long, stands close to *S. nipponense*, its more fully calcified plates being a character which would certainly be found in the young of the Japanese species; yet from the different relative sizes of the lower plates, I think the two forms are specifically distinct. (Fig. 29.)

GROUP OF SCALPELLUM GRUVELI.

SCALPELLUM IMPERFECTUM, new species.

Type.—Cat. No. 32914, U.S.N.M.

Type-locality.—*Albatross* Station 2731, northeast from Hatteras, north latitude 36° 45′, west longitude 78° 28′, 781 fathoms, seated on *Scalpellum velutinum* Hoek.

Other localities.—Cat. No. 12891, Station 2741, east of mouth of Chesapeake Bay, north latitude 37° 44′, west longitude 73° 57′, 852 fathoms. Cat. No. 9007, Station 2196, north latitude 39° 35′, west longitude 69° 44′, in 1,230 fathoms green mud, on an Echinoderm spine.

The capitulum is composed of 13 valves, those of the upper whorl imperfectly calcified. The valves are joined by wide, chitinous sutures. The scutal and carinal margins are regularly convex throughout. The apex is obtuse. The cuticle is thin and smooth, and the plates are weakly marked with growth lines.

FIG. 30.—SCALPELLUM IMPERFECTUM. LATERAL VIEW OF TYPE × 14.

The scutum is triangular, narrow above, over twice as long as wide, with a small wing or triangular projection on the lateral side of the apex. The occludent margin is slightly convex, longer than the straight lateral margin. The umbo is apical.

The tergum is V-shaped, the two branches of about equal width, and both are somewhat curved. That along the occludent margin is truncate at the end under the apex of the tergum. The other branch is much longer and tapers to an acute end. The apex is rather strongly recurved and acute, but a chitinous border projects beyond it along the occludent margin, and there is a very small wing on the carinal side of the apex.

The carina is widely separated from the other plates. It is abruptly bent at the umbo, which is situated between the upper third and fourth of the whole length of the plate. The roof is flat, bounded by angles or low ribs, and with nearly straight growth lines. The sides are moderately wide in the middle, tapering above and below. The base is almost squarely truncate.

The upper lateral plate is widely separated from the other plates, piriform, narrower above, the scutal and tergal margins straightened, baso-carinal margin irregularly rounded. The umbo is at the upper third of the length of the plate.

There is no rostrum.

The rostral latus is narrow, the scutal and basal margins parallel. Umbones at the upper front angle, and in contact.

The inframedian latus is narrow, somewhat the shape of a wine glass, a little expanded at the base and summit, narrower at the lower third. Umbo median at the lower third.

The carinal latus is of a curved triangular shape, the carinal margin concave, baso-lateral margin convex. The apex projects well beyond the carina, as in *S. scalpellum*, etc.

The peduncle is short, with about eight rows of five scales each.

Length of the capitulum 29 mm., breadth 20 mm. Length of the peduncle 14 mm. Length of carina 27 mm., diameter at base 5 mm.

The mandible (Plate IV, figs. 17, 18) has four teeth, counting the lower point. The first tooth is rather widely separated from the second. The lower point, shown more magnified in fig. 18, is obtuse, ending in a group of fine spines.

The first pair of cirri has unequal rami of 9 and 13 joints. The shorter, anterior, ramus is about twice as wide as the other. Both are densely hairy and spinose.

The sixth pair of cirri has rami with about 36 segments. An intermediate segment of the outer ramus is figured (Plate IV, fig. 15). There is a series of long spines along the anterior margin, four on a segment. These are paired with shorter spines on the inner face, shown in dotted lines. There are also several short spines at the sutures. The posterior edge is very minutely spiculose, and has three spines on a segment, the uppermost one large, the others quite small. There is also a row of short spines on the inner face, more or less distinctly visible through the segment, and shown on the figure in dotted lines. The spines diminish in size toward the bases of the rami, and in number toward the apices, as in all other forms.

The caudal appendage (Plate IV, fig. 16) consists of 6 joints, terminating in a group of 6 long spines. There are also smaller spines at the sutures.

This species differs from others of the partially calcified group by having only the terga V-shaped, and with the carina and lower whorl of plates resembling species of the *S. scalpellum* group. *S. compressum* Hoek, from the equatorial Pacific, 2,150 fathoms, has some resemblance to *imperfectum*, and the antipodal *S. intermedium* also resembles it except in the form of the carina and lower plates. *S. imperfectum* is very closely related to *S. sanctæbarbaræ* from the Californian coast, but the carina of the latter has a less projecting umbo, its roof is not so flat, and it is rounded at the base, and widely separated from the carinal latera. The carinal latera do not project below the carina; and, moreover, the plates of the lower whorl are more reduced in size in *S. sanctæbarbaræ*.

The largest example of the type lot has a capitulum 35 mm. long. Those from other stations are smaller. In No. 9007, an individual with the capitulum 20 mm. long, the carinal latera do not project behind the carina. Otherwise the plates are like those of the larger individuals. (Fig. 30.)

SCALPELLUM SANCTÆBARBARÆ, new species.

Type.—Cat. No. 32915, U.S.N.M.

Type-locality.—*Albatross* Station 2839, off the Santa Barbara Islands, California, in 414 fathoms.

Other locality.—*Albatross* Station 2980, off Southern California, 603 fathoms.

The capitulum is irregularly ovate, composed of 13 imperfectly calcified plates, covered with a very thin smooth cuticle. The ventral margin is strongly curved or subangular at the junction of scuta and terga. The summit is obtuse. The dorsal outline is very convex, subangular at its upper third. The calcified portions of the plates are nearly smooth.

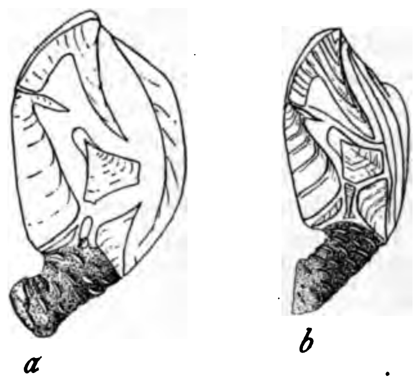


FIG. 31.—SCALPELLUM SANCTÆBARBARÆ *a*, TYPE; *b*, A YOUNG INDIVIDUAL × 1¼.

The scutum is triangular, with a short narrow tergal branch at the apex. The occludent segment is about 2½ times as long as wide, convex, with nearly straight occludent and lateral margins, and an oblique, straight basal margin.

The tergum is V-shaped, both branches curved, the carinal branch somewhat the longer. The apex is very slightly recurved, a chitinous lobe on the occludent border is wider above, projecting, rounded, and obtuse above the calcified umbo of the plate.

The carina is strongly arcuate, very obtusely subangular at the umbo, which lies at the upper fourth of the plate, and projects but little. The roof is broad and flat, with bordering angles, distinct above, obtuse near the base. The sides are extremely narrow, widest under the umbo. The upper end of the carina is rounded and approaches close to the apices of the terga. The base is rounded.

The upper latus is broadly spatulate, the long scutal and tergal margins concave, basal and carinal margins equal and very short, with a straight margin between them. The umbo is near the base of an upper narrow tongue-shaped appendage of the plate.

There is a small wedge-shaped rostrum, either wholly chitinous or with a very small calcareous center; often it is hardly noticeable, and sometimes apparently wanting.

The rostral latus is extremely narrow and long. The inframedian latus is long and narrow, the carinal and rostral sides parallel, upper end truncate, and the lower end somewhat dilated, basal margin straight. The umbo is at the middle close to the basal margin.

The carinal latus is irregularly triangular, the carinal margin longest, straight. The basal margin is oblique, straight, curving into the concave or straight upper margin. The umbo is basal and those of both latera are contiguous below the carina, but not projecting.

The peduncle is short, with ten rows of about ten transversely lengthened scales, of which only the ridges are calcified.

Length of capitulum 20, breadth 14 mm.; length of peduncle 8 mm. Length of carina 19, diameter at base 5 mm.

A series of 10 individuals was taken at the type-locality. The calcified portions of the plates are comparatively larger in the young specimens with a capitulum 13 mm. long, but otherwise similar to the adult stage. In some examples a small triangular rostrum is distinctly developed, sometimes with a minute calcified center; but in others it can not be distinguished. The largest capitulum is 24 mm. long.

A single mutilated capitulum was taken at Station 2980.

In the figured adult the umbo of the carina is worn, as is usual in large specimens of the species. An immature individual of the type lot, with the capitulum narrower and the carina perfect, is also illustrated. It measures, length of capitulum 17, width 10 mm. The carina is less arched in young than in old examples.

This species is closely related to *S. imperfectum* of the east coast of the United States, but it differs by the narrower rostral latera, the less projecting umbones of carina and carinal latera, the less distinctly wineglass shaped inframedian lateral plate, the longer tergo-lateral lobe of the scutum, etc.

S. sanctæbarbaræ and *S. imperfectum* are related to *S. gruveli* Annandale, from the Indian Ocean, yet among other differences they are unlike *S. gruveli* in having the umbo of the carina much farther removed from the apex of the plate, the upper latus is more broadly triangular, and the scales of the peduncle are smaller. (Fig. 31.)

SCALPELLUM LARVALE Pilsbry.

1907. *S. larvale* Pilsbry, Bulletin of the Bureau of Fisheries, XXVI, p. 194, pl. vi, figs. 2–6.

Type.—Cat. No. 32417, U.S.N.M.

Type-locality.—*Albatross* Station 4353, off Point Loma Light-House, California, 639 fathoms.

Subfamily OXYNASPIDINÆ.

Genus OXYNASPIS Darwin.

OXYNASPIS PATENS Aurivillius.

1894. *Oxynaspis patens* AURIVILLIUS, Kongliga Svenska Vetenskaps-Akademiens Handlingar, XXVI, No. 7, p. 38, pl. III, figs. 1, 2. Near Anguilla Island.

Locality.—Cat. No. 11533, U.S.N.M. *Albatross* Station 2651, Bahamas, north latitude 24° 02′, west longitude 77° 12′ 45″, in 97 fathoms.

Subfamily LEPADINÆ.

Genus LEPAS Linnæus.

1758. *Lepas* LINNÆUS (part) Syst. Nat., 10th ed., p. 667.[a]
1851. DARWIN, Monograph on the Cirripedia, Lepadidæ, p. 67.

Valves 5, approximate; carina extending up between the terga, terminating below in an embedded fork or external disk; scuta subtriangular, umbones at the rostral angle; caudal appendages uniarticulate (Darwin).

Type.—*Lepas anatifera* Linnæus.

Common in all seas on floating objects. The following key is slightly modified from Hoek.

KEY TO AMERICAN SPECIES.

a. Carina terminating below in a flat oblong external disk, umbo angularly projecting; valves thin, papery .... *L. fascicularis.*
aa. Carina terminating below in a fork, umbo basal; valves well calcified.
  b. Valves radially furrowed or strongly striate.
    c. Occludent margin of the scutum arched, protuberant .... *L. anserifera.*
    cc. Occludent margin close to the ridge from the umbo to the apex .. *L. pectinata.*
  bb. Valves smooth or very minutely striate radially.
    c. Valves smooth or delicately striate; an internal umbonal tooth on the right-hand scutum .... *L. anatifera.*
    cc. Valves not striate radially; no internal umbonal teeth on the scuta .. *L. hillii.*

LEPAS ANATIFERA Linnæus.

Plate IX, figs. 3, 4, 5.

1758. *Lepas anatifera* LINNÆUS, Syst. Nat., 10th ed., p. 668.
1851. DARWIN, Monograph on the Cirripedia, Lepadidæ, p. 73.

This is our most abundant goose-barnacle on driftwood, etc. It resembles *L. hillii*, but may be distinguished by the finely, faintly striated valves, the presence of an umbonal tooth in the right scutum, none in the left, and the proximity of the base of the carina to the

[a] The genus *Lepas* was proposed by Linnæus in 1758 to include both sessile and stalked barnacles. Da Costa, in 1778, excellently defined the genus *Balanus*, thereby removing the sessile forms from Linnæus's group, and leaving it for the goose-barnacles, for which the name *Lepas* has almost universally been reserved.

scutum. The carina is often dentate along the roof, and frequently the scutum has an oblique series of square gray spots; but these features are inconstant. Among many other lots, specimens are in the collection from the following:

Localities.—Atlantic: Vineyard Sound and Woods Hole, Massachusetts; Long Island Sound; off New Jersey, Station 2039; Key West; Gulf of Mexico, Station 2379; Cameron, Louisiana; St. Thomas; Swan Island, Caribbean Sea. Also many European localities.

Pacific: Bering Island; Sitka; Unalaska; Straits of Fuca, Oregon; San Diego, California; Panama; Japan.

LEPAS HILLII Leach.

Plate VIII, figs. 2, 7.

1851. *Lepas hillii* LEACH, in Darwin, Monograph on the Cirripedia, p. 77.

This common goose-barnacle is very similar to *L. anatifera*, from which it is chiefly to be distinguished by the smoother valves, the absence of umbonal teeth within the scuta, and the presence of three filaments on each side of the body, while *L. anatifera* has only one or two. When fresh, the carina is separated from the other valves at the base by a purplish cuticle, and the summit of the peduncle is pale or orange colored.

Localities.—Atlantic: Grand Manan, New Brunswick; Le Have Bank. Pacific: Bering Island, abundant; Shumagin Island; Unalaska; San Francisco.

A variety *californiensis* Gruvel has been described from Lower California. It is not represented in the museum collection.

LEPAS ANSERIFERA Linnæus.

Plate VIII, figs. 1, 3.

1851. *Lepas anserifera* DARWIN, Monograph on the Cirripedia, Lepadidæ, p. 81.

This species is commonly found on driftwood and also on floating seaweeds, in the latter case frequently associated with *L. pectinata.* The plates are *grooved radially*, the tergum often more strongly than the scutum, but the grooves vary greatly in emphasis. It differs from *L. pectinata* chiefly in the scutum and carina. The occludent border of the scutum is strongly arched, forming a comparatively wide area between the border and the ridge running from the umbo to the apex of the plate, and the carina is not contracted just above the fork. In *L. pectinata* the ridge on the scutum runs very close to the less arcuate occludent border, leaving but a very narrow area, and the carina viewed dorsally is conspicuously contracted just above the basal fork.

Localities.—Atlantic: Shetland Islands and Oban, Scotland; Cork, Ireland; Fayal, Azores; south of Newfoundland, Hydrographic Sta-

tion 756; Georges Bank; off Marthas Vineyard; Asbury Park, New Jersey; Smiths Island and Cherrystone, Virginia; off Cape Hatteras; off east coast of United States, *Albatross* stations 2104, 2711, 2097, 2221, 2713, 2711, 2712, 2714, 2715, 2584, etc.; off Florida, *Albatross* Station 2647; Gulf of Mexico, *Albatross* Station 2379; Cameron, Louisiana; Jamaica, C. B. Adams; Caribbean Sea, *Albatross* Station 2127.

Pacific: Gulf of California, *Albatross* Station 2998; between California and Hawaiian Islands, Hydrographic Station 2665; Honolulu; off Japan, *Albatross* Station 3766; Philippine Islands, E. A. Mearns.

Indian Ocean: Longitude 90° east, on the equator, Capt. J. R. Lyon.

LEPAS PECTINATA Spengler.

Plate VIII, figs. 4, 5, 6, 8.

1851. *Lepas pectinata* DARWIN, Monograph on the Cirripedia, Lepadidæ, p. 85.

A common form on "gulf weed." The valves are radially striate or grooved or are often profusely spinose (fig. 4). It can be distinguished from *L. anserifera* by the very narrow area between the occludent border and the ridge from umbo to apex of the scutum. The tergum is notched to receive the apex of the scutum. The smoother forms of the species often have the capitulum conspicuously inflated (figs. 5, 6). *Lepas pectinata* is pelagic, and chiefly flourishes in warm seas.

Localities.—Atlantic: Oban, Scotland; South of Newfoundland, *Albatross* Hydrographic Station 756; Georges Bank; off east coast United States, *Albatross* stations 2314, 2097, 2109; Gulf of Mexico, *Albatross* Station 2379; off east coast of South America, *Albatross* Station 3766, south latitude 36° 47′.

Pacific: Bering Island, Bering Sea; off San Diego and Santa Catalina Island, California.

LEPAS FASCICULATUS Ellis and Solander.

Plate IX, fig. 6.

1851. *Lepas fasciculatus* DARWIN, Monograph on the Cirripedia, Lepadidæ, p. 92, pl. I, fig. 6.—VERRILL, Invert. Anim. Vineyard Sound, etc., p. 285, in Rep. Commissioner Fish and Fisheries for 1874, pp. 382, 579, pl. VII, fig. 34.—PILSBRY, Bulletin of the Bureau of Fisheries, XXVI, 1907, p. 193.

A pelagic form, easily known by the thin, paper-like plates, and the angularly bent carina, with a prominent umbo and expanded basal disk. It should be separated subgenerically from the other Lepades.

Localities.—Atlantic: Off Nova Scotia; Grand Manan, New Brunswick; off Marthas Vineyard and Nantucket; off North Carolina, etc.; *Albatross* stations 2021, 2532, etc.

Pacific: Between San Francisco and Unalaska, *Albatross*, July 18, 1891; latitude 29° 52′ north, longitude 116° 15′ west, R. E. C. Stearns; off Japan, *Albatross* Station 3766, surface.

Genus PŒCILASMA Darwin.

1851. *Pœcilasma* DARWIN, Monograph on the Cirripedia, Lepadidæ, p. 99, first species *P. kæmpferi.*

1884. *Temnaspis* FISCHER, Bull. Soc. Zool. de France, IX, 1884, p. 357, for *P. fissa* Darwin.

Capitulum of five fully calcified approximate valves, the umbones of scuta and carina basal; carina not extending between the terga, narrow throughout. No lateral filaments at bases of the cirri; caudal appendages one-jointed, spinose. Cirri ii to vi with 4 or 5 pairs of long spines on the anterior side of each segment.

Type.—P. kæmpferi.

The discovery of new forms has materially enlarged the group of pentaspidian barnacles of the *Pœcilasma* type since Darwin's time, and some notes on their classification and nomenclature may be in order. The oldest generic name for a species of the series is *Trilasmis* Hinds, based on *T. eburneum* Hinds. If we consider this species to be a *Pœcilasma*, then the name *Trilasmis* must replace *Pœcilasma*, since it is anterior in date. In a former paper I admitted both groups as genera, thinking the peculiar structure of the carina of *Trilasmis* justified this course.[a] It must be conceded that *T. eburneum* does not differ from *Pœcilasma* much more than *Lepas fascicularis* from the other species of *Lepas;* yet I think no advance in our conceptions would result from merging *Pœcilasma* in *Trilasmis*. but rather the reverse.

Pœcilasma, after the elimination of *Trilasmis*, still contains very diverse species, and those like *P. carinatum*, *P. rectum*, etc., with the carina enlarged basally, should probably be separated from *Pœcilasma* and united to *Megalasma* as a subgenus. For the present I erect a subgenus *Glyptelasma* for them. This group stands between *Pœcilasma* and *Megalasma*, and doubtless was ancestral to the latter genus, which differs from *Glyptelasma* only by the rotation of the basal margin of the scutum through 90°, bringing it in line with the occludent margin. The apparent change in the position of the umbo is due to this rotation. Morphologically its position is the same in *Megalasma*, *Pœcilasma*, and *Lepas*.

The characters of the groups under discussion are exhibited in the following analytical key.

KEY TO GENERA AND SUBGENERA.

a. Carina expanded around and below the umbo in a flat, rounded disk, the upper end acute; no terga; upper margin of scutum rounded .... *Trilasmis.*

aa. Carina with basal, terminal umbo, the upper end obtuse; terga present.

b. Carina narrow throughout, not expanding laterally at the base; surface of the valves smoothish.

[a] Bulletin of the Bureau of Fisheries, XXVI, 1907, p. 183.

c. Scutum not slit; cirri normal .... *Pœcilasma.*

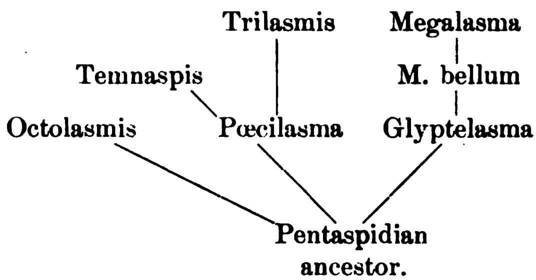
cc. Scutum usually divided by an arcuate slit; cirri peculiar....... *Temnaspis.*

bb. Carina with wide sides, expanding laterally in the lower part or at the base; scutum biangular above, with a distinct ridge to tergo-carinal angle; surface roughened.

c. Basal or peduncular margin of scutum making a right angle with the occludent margin, the umbo at the angle.................... *Glyptelasma.*

cc. Basal or peduncular margin of scutum a continuation of the occludent margin, the umbo therefore above the basal angle of the plate... *Megalasma.*

The relations of the groups are expressed in the following diagram:



I have examined the mouth parts and cirri in *Pæcilasma kæmpferi*, *P. k. litum*, *P. inæquilaterale*, *Megalasma annandalei*, and *M. gracilius*. There is an unusual uniformity throughout these forms. The armature of the cirri reminds one of *Scalpellum*.

KEY TO AMERICAN SPECIES OF PŒCILASMA AND MEGALASMA.

a. Carina wide in its lower part, expanding laterally near the base.

b. Basal margin of the scutum about at a right angle with the occludent margin. East American.

c. Umbo of carina projecting beak-like below the base of the scutum, and at an angle with it.

d. Basal margin of carina as long as the base of the scutum, its sides wide in the lower half .... *M. g. gracilius.*

dd. Basal margin of carina shorter than base of scutum, its sides wide in the lower third.. *M. annandalei.*

cc. Umbo of carina not produced below base of scutum.

d. Occludent margin nearly straight; carina with the basal margin straight, the sides narrow, abruptly auriculate at base.................. *M. rectum.*

dd. Occludent margin well arched; carina with very wide sides, the basal margin as long as that of the scutum .... *M. subcarinatum.*

bb. Basal margins of the scutum and carina nearly parallel to the occludent margin; sides of carina very wide. Hawaiian.............................. *M. bellum.*

aa. Carina narrow throughout, not expanding laterally at the base.

b. Carinal end of the tergum very short......................... *P. inæquilaterale.*

bb. Carinal end of the tergum longer, about half as long as the occludent margin.

c. A distinct ridge or angle extending from umbo to tergo-carinal angle of scutum; basal margin of scutum less than half the length of the tergum.. *P. kæmpferi novæangliæ.*

cc. No distinct ridge to the tergo-carinal angle of scutum.

d. A narrow area between the ridge from umbo to apical angle of scutum, and the occludent border.......................................*P. kæmpferi.*

dd. A rather wide area between the ridge and the occludent margin. *P. kæmpferi litum.*

Subgenus PŒCILASMA s. str.

Smoothish forms with narrow carina and surface sculpture of fine engraved striæ, the scutum not slit; living chiefly on the carapaces of crabs. The species are closely related and variable, and their determination is difficult. The capitulum is often bilaterally asymmetrical. All known American forms are figured on Plate VI.

PŒCILASMA KÆMPFERI Darwin.

Plate V, figs. 10, 11; Plate VI, figs. 3, 4, 5.

1851. *Pœcilasma kæmpferi* DARWIN, Monograph on the Cirripedia, Lepadidæ, p. 102, pl. II, fig. 1 (Japan, on *Inachus kæmpferi*).—PILSBRY, Bulletin of the Bureau of Fisheries, XXVI, 1907, p. 183 (Hawaiian Islands).

Locality.—Cat. No. 28653, U.S.N.M. Japan, on *Kæmpferia kæmpferi.*

The largest of three capitula measures, length 14, width 8.5, diameter 4.3 mm. Carina 9 mm. long. Peduncle 6.5 mm. long. The left scutum is somewhat more convex than the right. The scuta have distinct radial striæ and some concentric grooves.

Internally the scuta have strong umbonal teeth and a rather narrow, smooth, and rounded basal callous rib (Plate VI, fig. 3). The carina (figs. 4, 5) is concave inside, the concavity decreasing toward the base. The teeth at its baso-scutal angle are very small, and in the example examined, asymmetrical.

The mandible of No. 28653 has four teeth and a small lower point, the upper two teeth widely spaced. There is a small beard on the lower margin, scarcely any on the upper (Plate V, fig. 11).

The maxilla (Plate V, fig. 10) has two large upper spines, the edge deeply notched below them, sparsely spiny in the notch. It then protrudes and is rather closely set with spines.

Cirri are about as figured for *Megalasma annandalei.*

M. Gruvel, in his report on the *Travailleur* and *Talisman* Cirripedes, has considered *P. aurantia* Darwin a variety of *P. kæmpferi*, stating that of seven examples taken off Cape Bojador in 410 to 782 meters, part had characters of the one, part of the other form.[a] No western Atlantic examples I have seen agree entirely with the Japanese or eastern Atlantic forms, as defined by Darwin and Gruvel; and while their differential characters are not of great importance, yet it seems desirable that they be put on record.

---

[a] See Zool. Trav. et Talism., Cirrhipèdes, p. 46, pl. IV, fig. 1.

PŒCILASMA KÆMPFERI LITUM, new subspecies.

Plate VI, figs. 1, 2.

Type.—Cat. No. 32902, U.S.N.M.

Type-locality.—U. S. Fish Commission steamer *Fish Hawk* Station 7512, Gulf Stream off Fowey Rocks Light, Cape Florida, 170 fathoms.

The capitulum is equilateral, somewhat less swollen than the Japanese *P. kæmpferi* examined. Scutum and tergum have distinct radial striæ and very fine, close growth-lines. The ridge from umbo to apex of the scutum is well defined, but that to the tergo-carinal angle is barely indicated. The base of the scutum is about three-fifths the length of the tergum. The occludent margin is very convex in its upper half, the area in front of the ridge running to the apex being wider than in *P. kæmpferi.* Internally each scutum has an umbonal tooth and a narrow but rather high and sharp straight basal ridge. The tergum is shorter than in *P. kæmpferi*, barely half as long as the scutum.

Length of capitulum 12, width 6.8, diameter 3.3 mm. Length of carina 7.8, of peduncle 5 mm.

The mouth parts and cirri closely resemble those of Japanese *P. kæmpferi.*

PŒCILASMA KÆMPFERI NOVÆANGLIÆ, new subspecies.

Plate VI, figs. 13, 14.

Type.—Cat. No. 9032, U.S.N.M.

Type-locality.—U. S. Fish Commission Station 1120, off Marthas Vineyard, 194 fathoms, on carapax of *Eupagurus politus.*

Larger than *P. kæmpferi;* the capitulum equilateral. The scutum has a strong ridge running from the umbo to the apex, and another to the tergo-carinal angle. The basal margin is very short, less than half the length of the tergum. It is sculptured with distinct radial striæ and growth-wrinkles.

Length of the capitulum 17, breadth 9.7, diameter 5.75 mm. Length of the carina 12, of the peduncle 9 mm.

In *P. kæmpferi* and *aurantia* there is no distinct ridge from the umbo to the tergo-carinal angle of the scutum, and the base is longer.

A very small example, No. 9019, from *Albatross* Station 2115, is probably referable to the above subspecies. It occurred on *Lithodes agassizii.*

PŒCILASMA INÆQUILATERALE, new species.

Plate VI, figs. 6, 7, 8, 11, 12.

Type.—Cat. No. 12899, U.S.N.M.

Type-locality.—*Albatross* Station 2744, 38° 35′ north latitude, 73° 05′ 15″ west longitude, 554 fathoms.

Other localities.—Off the eastern coast of the United States between 39° 53′ and 37° 34′ 30″ north latitude at *Albatross* stations 2030, 2171, 2179, 2180, 2181, 2201, 2202, 2215, 2216, 2234, 2235, 2546, 2552, 2680, 2691, 2739, 2742, 2744, 2749, in 444 to 963 fathoms, chiefly on carapax of *Geryon quinquedens*. Fish Commission Station 1140, off Marthas Vineyard, 374 fathoms, on *Geryon*. *Albatross* Station 2237, Hampton Roads, 12 fathoms on *Geryon*. Off Key West, Florida, 70–80 fathoms, on *Scyramathia crassa*, State University of Iowa Expedition, 1893.

The capitulum is inequilateral, oblong, the occludent border only weakly convex, the carinal strongly so. The plates are white or faintly pink-tinted, glossy, with minute sculpture of fine radial striæ and low rather coarse concentric wrinkles; the narrow area between the occludent margin and the apico-umbonal keel has very fine oblique striæ.

The scutum has a moderately arcuate occludent border, the greatest curvature being near the apex and base. The umbo is somewhat produced and incurved. The basal margin is short and oblique. Only a very weak trace exists of a curved ridge from umbo to the junction of tergum and carina, and there is no distinct angle in the outline of the plate at the tergo-carinal suture. A distinct ridge or angle runs from the umbo to the apex, nearly straight in its apical half, and defining a narrow occludent area. Internally there is a strong but narrow rounded basal rib and a stout but low umbonal tooth. The two scuta are more or less unequal in convexity.

The tergum is small and wedge-shaped, but wider than the carina, the carinal end being truncate or rounded. It has radiating and growth striæ.

The carina is regularly arcuate, very narrow and slender, with narrow rounded roof. The roof is slightly wider above than near the umbo, but the sides are somewhat wider below. Internally the surface is concave near the umbonal end, elsewhere convex. There are no distinct teeth, and no post-umbonal expansion or disk.

The peduncle is short, one-half to one-fourth the length of the capitulum, with prominent annuli as in related species.

Length of the capitulum 11.5, width 7, diameter 3.2 mm.

The mouth parts and cirri closely resemble those of *P. kæmpferi*, but the edges of the teeth of the mandible are slightly serrate.

This species ranges along the east coast of the United States from Marthas Vineyard to Key West, usually living on the crab *Geryon quinquedens*, often in great profusion, in depths of 500 to 800 fathoms, though one lot was taken in but 12 fathoms. It is very variable in the degree of asymmetry, some individuals being nearly symmetrical bilaterally. Either the right or the left scutum may be the more

convex. The size of adult examples is also subject to considerable variation.

P. inæquilaterale is closely related to *P. kæmpferi*, but it differs by the decidedly smaller tergum, less arcuate occludent border and frequently more asymmetrical valves, though some individuals are nearly equivalve. *P. crassum* is a shorter, wider form, with the occludent border more strongly arched, and having a well-developed embedded appendage at the umbonal end of the carina, wanting in *P. inæquilaterale*.

There is great variation in the degree of asymmetry among the specimens from most stations. Either the right or the left valve may be the more convex. Figs. 6, 7, 11, and 12 represents individuals of the type lot, figs. 6 and 7 being the type. The interior, fig. 8, is drawn from specimens taken off Key West, Florida, in 70 to 80 fathoms, on *Scyramathia crassa* A. Milne-Edwards.

PŒCILASMA INÆQUILATERALE BREVE, new subspecies.

Plate VI, figs. 9, 10.

Type.—Cat. No. 32919, U.S.N.M.

Type-locality.—*Albatross* Station 2352, Gulf of Mexico, north latitude 22° 35′, west longitude 84° 23′, in 463 fathoms, on *Bathyplax typhla* A. Milne-Edwards.

Similar to *P. inæquilaterale*, but the capitulum is very short and broad, and the tergum is much reduced. It differs from *P. crassum* by the straight occludent border of the scutum.

Length of the capitulum 7.5, breadth 5.3, diameter 3 mm.

Only two specimens were taken.

Genus MEGALASMA Hoek.

1883. *Megalasma* HOEK, Challenger Report, Zoology, VIII, p. 50. Type, *M. striatum*.

This genus differs from *Pœcilasma* in the shape of the carina, which is enlarged at the sides toward the base, with a concave plate inside, terminating upward in two stout teeth. The peduncle is very short. So far as I know, they do not live on crabs. The relationships of the group are discussed under *Pœcilasma*.

Subgenus GLYPTELASMA Pilsbry, new subgenus.

The type of this group is *M. subcarinatum*. These barnacles live chiefly on sea-urchin spines, on the larger forms of *Scalpellum*, etc., not, so far as I know, on crabs. The peduncle is quite short, not so long as in typical *Pœcilasma*.

MEGALASMA GRACILE GRACILIUS, new subspecies.

Plate V, fig. 16. Plate VII, figs. 6, 7, 8, 9.

Type.—Cat. No. 11346, U.S.N.M.

Type-locality.—From *Albatross* Station 2625, between Cape Hatteras and Charleston, South Carolina, on spines of *Dorocidaris papillata*, No. 12938, 247 fathoms.

Other localities.—Cat. No. 32900, U.S.N.M., *Albatross* Station 2658, between the Bahamas and Cape Fear, North Carolina, on *Scalpellum giganteum* Gruvel, in 514 fathoms.

The capitulum is twice as long as wide, widest in the middle, strongly inflated just below the middle, compressed above the inflation. The carinal border is much more convex than the occludent. The plates are sculptured with fine and very inconspicuous radial striæ and rather coarse wrinkles and occasional grooves along the lines of growth. The basal foramen is subcircular and small.

The scutum has a moderately curved occludent margin and very short basal margin. The straight tergal margin is slightly shorter than the carinal, which is convex, except near the base, where it is somewhat concave. A sharp keel runs from the umbo to the apical angle, and a strong angle to the tergo-carinal angle. The area in front of the keel is very narrow, with its fellow forming a narrowly lanceolate figure in ventral view. Internally there is a very small umbonal tooth in each valve and a small polished basal area of attachment of the peduncle, but no basal callus. (Fig. 7.)

The tergum is rhombic, its carinal margin about one-third as long as the occludent. Its surface is divided into two unequal areas by a diagonal line from the apex to the baso-carinal angle, the larger area being grooved lengthwise of the plate, the narrow upper area marked with lines at right angles to the other.

The carina (figs. 8, 9) is moderately and evenly curved, with a flat roof. The umbo projects beak-like far beyond the base of the scutum. The basal margin of the carina is fully as long as that of the scutum and forms a right angle with it. The sides of the carina are very wide in the basal third and are obliquely grooved. Inside the carina is slightly concave throughout, and a narrow cavity penetrates downward to the apex, behind a concave plate which extends over the basal region of the cavity. This plate becomes narrower above, is truncated, and its sides project to form two blunt teeth.

The peduncle is extremely short, about one-tenth the length of the capitulum, and scarcely extending beyond the umbo of the carina. It is transversely wrinkled and blackish.

Length of the capitulum (measured to the umbo of the carina) 11.8 mm., width 5 mm., diameter 3 mm. Length of the carina 7.75 mm.

The largest specimen measures, length 12.7, width 5.5, diameter 3.3 mm.

The mandibles and cirri resemble those of *P. kæmpferi*, but the maxilla (Plate V, fig. 16) has weaker spines at the upper angle, and its edge is much less deeply notched below them.

This form stands very near *M. gracile* Hoek, which is possibly from a mid-Atlantic station; but in *M. gracile* the lower area of the scutum is smaller, the tergum longer, and the carina more curved than in *M. g. gracilius*. The peduncle, too, is longer, one-third the length of the capitulum in Hoek's species, while in the series of seven *M. g. gracilius* it is extremely short.

Pœcilasma gracile Hoek was described from the *Challenger* station "164A, off Sydney, New South Wales, in 410 fathoms." Station 164B has been given for the locality of a series of mollusks in part of distinctly Atlantic relations.[a]

That they really came from the Australian station was doubted by the present writer.[b] Finally Mr. Charles Hedley[c] advanced the theory that 164B might be an error for 64, a station in the mid-Atlantic between Bermuda and the Azores, where, in 2,700 fathoms, "about a cwt. of ooze" was secured. The Australian Stations 164 and 164A were merely sounding stations,[d] the former in 950, the latter in 1,200 fathoms. No specimens other than "green mud" were reported as taken in the account of these soundings. From the alleged depth, 410 fathoms, it is obvious that the adjacent station, 164B, is the one intended by Hoek. The facts in the case, so far as known, favor Mr. Hedley's supposition that there was an error in reading the label and a mixture of material from two stations. It is possible, therefore, that *Pœcilasma gracile* is an Atlantic and not an Australian species.

MEGALASMA ANNANDALEI, new species.

Plate V, fig. 14. Plate VII, figs. 15–19.

Type.—Cat. No. 32901, U.S.N.M.

Type-locality.—*Albatross* Station 2731, off Cape Hatteras, on *Scalpellum velutinum*, in 781 fathoms.

The capitulum is twice as long as wide, compressed in its upper half, the lower half very plump. The occludent margin is moderately convex, the carinal margin strongly so. The plates are strong, white, and sculptured with very fine and faint radial striæ and rather widely spaced strong concentric grooves, with very fine intervening growth-striæ on the scuta, more crowded grooves on the terga. The peduncular orifice is nearly circular.

---

[a] See E. A. Smith, Proc. Malac. Soc. London, I, pp. 59, 60.

[b] Manual of Conchology, XVII, p. 122.

[c] Proc. Linn. Soc. N. S. Wales, 1901, p. 22; *cf.* also Rec. Australian Museum VI, p. 212.

[d] Challenger Reports, Summary of Results, Pt. 1, p. 576.

The occludent margin of the scutum is convex; the straight tergal margin is shorter than the carinal margin, which is straightened or a little concave near the base, then strongly convex. The basal margin is very short. An angle runs from the umbo to the apex, defining a very narrow lanceolate ventral area. A curved ridge or angle runs to the tergo-carinal angle. An oblique constriction or wide furrow defines an obliquely sulcate basal area. Internally the scutum has a small umbonal tooth and a wide, low, and smooth basal callus.

The tergum is rhombic, the occludent margin parallel with the carinal, the latter more than half the length of the former.

The carina (figs. 18, 19) is moderately curved, with convex roof. The sides are narrow in the upper two-thirds, suddenly expanding in the lower third, and marked with narrow oblique riblets. The umbo is incurved and projects below the base of the scutum; the basal margin is as long as that of the scutum and forms an obtuse angle with it. Internally the carina is concave throughout. The cavity of the base is inclosed by a concave plate with notched upper margin, the sides being produced above in two short teeth.

The peduncle is cylindric, oblique to the capitulum, blackish, transversely wrinkled, and about one-fourth the length of the capitulum.

Length 19, width 9, diameter 5.5 mm. Length of the carina, 13 mm.

The teeth of the mandible are somewhat more slender and acute than in *P. kæmpferi*, and the upper and lower margins are bearded for a greater distance. The spines at the upper angle of the maxilla are more slender than in *P. kæmpferi*.

I have figured an intermediate segment from the sixth cirrus (Plate V, fig. 14). There are four pairs of large and one pair of small spines at intervals along the anterior side, and groups of 3 or 4 small spines at each articulation on the posterior side.

This species is related to *P. carinatum* Hoek, but differs by the strong concentric sculpture of the plates, the different form of the carina, especially interiorly, and the diverse sculpture of the interior of the scutum at its base.

MEGALASMA RECTUM, new species.

Plate VII, figs. 10–14.

Type.—Cat. No. 32895, U.S.N.M.

Type-locality.—*Albatross* Station 2042, east of New Jersey, near the following Station, in 1,555 fathoms.

Other localities.—No. 9016, U.S.N.M. *Albatross* station 2041, north latitude 39° 22′ 50″, west longitude 68° 25′, in 1,608 fathoms, globigerina ooze.

The capitulum is twice as long as wide, rather plump in the lower half, compressed above, the sides equally convex. The occludent margin is nearly straight, the carinal strongly convex. The valves

have a minute sculpture of fine, short, diverging impressions, giving the general effect of radial striæ, and coarse, widely spaced concentric ridges. The peduncular foramen is large and cordate in shape.

The scutum has a nearly straight occludent margin; carinal margin well arched. The basal margin is straight and forms an acute angle with the occludent. The basal edge flares broadly outward, there being a deep furrow or concavity above it. A distinct ridge runs almost straight from the umbo to the carino-tergal angle, dividing the plate into two areas, the upper one slightly the greater. Internally the scutum has no basal rib and no umbonal tooth. There is a dull or lusterless band along the internal basal margin where the peduncle is attached, contrasting with the glossy surface elsewhere. This band is of about equal width throughout and has no special sculpture. (Plate VII, fig. 12.)

The tergum is trapezoidal, with parallel occludent and carinal borders, the former double the length of the latter. A furrow runs from the umbo to the carino-scutal angle.

The carina (figs. 13, 14) is strongly arched; its roof is flat, with a median depression. The sides are well developed toward the base, closely striated longitudinally. On each side of the apical umbo the sides are auriculate, being produced laterally and twisted, the basal margin having somewhat the shape of a brace, thus: ⏞. The carina does not project basally as far as the scutum, and its base forms only the dorsal border of the peduncular foramen, not clasping the peduncle. When removed, the carina is seen to be concave internally. From the basal margin a very short, transverse, strongly bicuspid plate springs. This plate lies nearly parallel to the upper portion of the carina, but makes a right angle with the umbonal portion.

The peduncle is very short.

Length of the capitulum 15.5, breadth 7.5 mm., greatest diameter 4 mm; length of the carina 10 mm; length of the peduncle about 2 mm.

This species is related to *M. carinatum* Hoek, from near Culebra and Ascension islands, but differs by its straight occludent margin; the carina is longer, less expanded, and differently shaped basally, and the basal margin of the scutum is longer and flares strongly. The detached carina is shown in figs. 13, 14.

Three examples were taken at two adjacent stations.

MEGALASMA SUBCARINATUM, new species.

Plate VII, figs. 1–5.

Type.—Cat. No. 9059, U.S.N.M.

Type-locality.—*Albatross* Station 2042, east of New Jersey, 1,555 fathoms, on spines of a sea urchin.

Other localities.—No. 32899, U.S.N.M. *Albatross* Station 2041, north latitude 39° 22′ 50″, west longitude 68° 25′, near the preceding station, in 1,608 fathoms, globigerina ooze.

The capitulum is pointed-oblong, ventricose in the lower half, the occludent and carinal borders about equally convex, the total length about twice the greatest width. The plates are sculptured with fine, close, radiating impressions and distinct concentric wrinkles and spaced grooves. These are much closer on the terga and carina than on the scuta. The basal orifice is rounded-pentagonal, a little longer than wide.

The very large scutum has an evenly arched occludent border. The tergal margin is straight, the carinal convex, except near the base, where it is somewhat concave or hollowed out, to receive the enlarged side of the carina. The basal margin is short and straight. There is a depression running obliquely from the umbo to the concavity of the carinal margin. A subacute ridge runs from the umbo to the apical angle, defining a very narrow lanceolate area along the occludent margin. Another much less acute ridge runs to the tergo-carinal angle. The interior shows a small but prominent umbonal tooth in each (right and left) valve, and a small smooth basal area, which under a strong lens has very faintly traced radial and growth striæ. (Plate VII, fig. 3.) A small cavity extends from above under the umbonal tooth.

The tergum is trapezoidal, the carinal edge parallel to the occludent, and nearly half as long.

The carina is short, only slightly arcuate. Its roof is rather wide and flattened above. The sides are narrow above, but wider below the middle, and in the lower third it expands into a wide plate. The basal margin is straight, whether viewed from the side or back. In basal view the sides are seen to form a right angle. When detached the inner face of the carina is seen to be deeply concave throughout. A prominent septum or sheath, bilobed and projecting above, occupies slightly more than the lower fourth of the length. The cavity of the plate penetrates behind this septum to the apex.

The peduncle is very short, so short that the capitulum appears to be sessile.

Length of the capitulum 19, width 10, greatest diameter 5 mm.; length of the carina 12 mm.

Two other individuals of the type lot measure: Length of capitulum 16.5, width 8, diameter 4 mm.; length of carina 10 mm. Length of capitulum 16.2, width 8, diameter 3.8 mm.; length of carina 9.7 mm.

A very large detached scutum from the type locality measures 23 mm. long, indicating a larger size than any other known *Pœcilasma*.

The single specimen from Station 2041 measures: Length of capitulum 16.9, width 8.9, diameter 5 mm.; length of carina 10.4 mm.; length of the base of the capitulum 4.9 mm.

This species was taken at two adjacent stations in the Atlantic with *M. rectum*. It is closely related to *M. carinatum* Hoek, from off Culebra, off Ascension Island, and from Cuba, in from 390 to 500 fathoms, which has been described by Hoek[a] and by Gruvel,[b] yet the differences between the forms seem too numerous to permit us to unite them specifically.

M. carinatum has a proportionately narrower capitulum than *M. subcarinatum*, three times as long as wide. It is more contracted below; the basal outline is shorter. The valves seem to be smoother. According to Hoek, *M. carinatum* is "almost entirely smooth; when seen with a lens there appear fine striæ radiating from the umbones," whereas *M. subcarinatum* is rather coarsely wrinkled, as well as finely striate. There is not in *M. carinatum* such a distinct ridge from the umbo to the tergo-carinal angle of the scutum. The carina is more curved, and its upper portion more slender in *M. carinatum*, and it is less hollowed out internally. The basal internal areas of scutum and carina are also diverse in the two species. Since a number of individuals of both forms from several stations have been examined, it would appear that we have to do with two species closely related, yet, so far as present materials show, distinct.

Subgenus MEGALASMA Hoek.

MEGALASMA BELLUM (Pilsbry).

1907. *Pœcilasma bellum* Pilsbry, Bulletin of the Bureau of Fisheries, XXVI, p. 183, pl. iv, fig. 6.

Localities.—*Albatross* stations 4081 to 4084, off the north and northeast coast of Maui, in 202 to 267 fathoms; Station 4088, between Maui and Molokai, and Station 3893, Kaiwi channel, between Molokai and Oahu, in 220 fathoms. Bottom temperature from 46.7° to 51.7° F. These localities are additional to those given in the original account of this species.

Genus OCTOLASMIS Gray.

1825. *Octolasmis* Gray, Annals of Philosophy, X, p. 100, for *O. warwickii*.
1825. *Heptalasmis* Leach, MSS. in Gray, Annals of Philosophy, X, p. 100, based upon the same species.
1851. *Dichelaspis* Darwin, Monograph on the Cirripedia, Lepadidæ, p. 115, first species mentioned *D. orthogonia*.
1869. *Paradolepas* Macdonald, Proc. Zool. Soc., p. 442, for *P. neptuni*.
1894. *Trichelaspis* Stebbing, Annals and Magazine of Nat. Hist., 6th ser., XIII, p. 443, for *T. forresti*.

Small *Lepadidæ* with five incompletely calcified valves, or sometimes apparently with three when the terga are not calcified. The

[a] Challenger Reports, Zoology, VIII, Cirripedia, p. 44, pl. i, figs. 8–10; pl. ii, fig. 1; pl. vii, fig. 6. 1883.

[b] Transactions, Linnean Society of London, VIII, 1901, p. 157, pl. xvii, figs. 9–16.

umbones of the plates are situated as in *Pœcilasma*. The typical forms (*Octolasmis s. str.*, including *Paradolepas* and *Trichelaspis*) are fragile creatures mainly living as commensals on the gills of crabs or macrura, or on the walls of the gill cavity. They have the calcified portions of the valves much reduced, and the base of the slender carina is forked.

Another series of species, such as *O. orthogonia*, *sessile*, *americanum*, and *hawaiense* have more strongly calcified valves, the tergum more normally shaped, and the carina expanded into a disk at the base. These may retain the subgeneric name *Dichelaspis*, type *orthogonia*. They live externally on crabs, etc.

KEY TO NORTH AMERICAN SPECIES OF OCTOLASMIS.

a. Carina slender, distinctly forked at the base; tergum small, irregular. Living in the gill cavities of decapod crustaceans.

b. Scutum composed of a narrow occludent and a wide triangular lateral segment, separated by a rather narrow slit. Antilles, on *Palinurus* gills. *O. hoeki* Stebbing. *O. antiguæ* Stebbing.

bb. Upper margin of lateral segment of scutum at a right angle with the occludent segment.

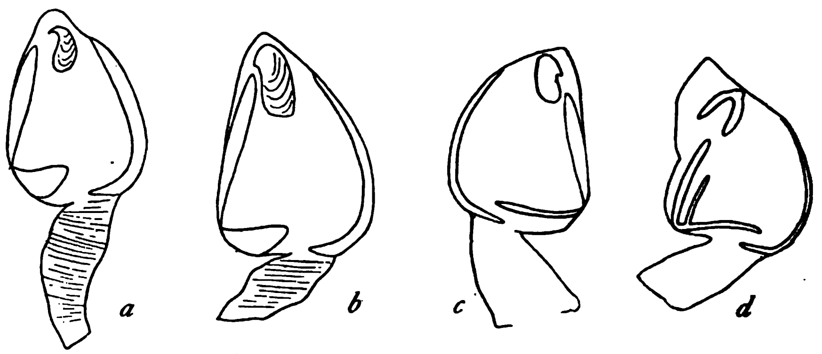


FIG. 32.—*a*, *b*, OCTOLASMIS GERYONOPHILA. *c*, O. MÜLLERI. *d*, O. FORRESTI. × 8.

c. Lateral branch of scutum rather wide, somewhat triangular and short, not more than half the length of the occludent branch; on crabs...... *O. geryonophila*.

cc. Lateral branch of scutum very narrow and nearly as long as the occludent branch.

d. Scutum composed of two branches; on crabs .... *O. mülleri*.

dd. Scutum composed of three slender branches; on *Palinurus*..... *O. forresti*.

aa. Carina stronger, expanded in a sort of collar at the base, partially clasping the peduncle; tergum triangular; living externally.

b. Scutum L-shaped, with a short lateral segment .... *O. americanum*.

OCTOLASMIS GERYONOPHILA, new species.

Type.—Cat. No. 9038, U.S.N.M.

Type-localities.—*Albatross* stations 2215 and 2216.[a]

[a] The specimens from these two stations were not kept separate in the collection.

Distribution.—Beyond the 400-fathom line, from south of Nantucket to off the Delaware Capes, in the branchial cavity of *Geryon quinquedens*, at the following stations:

Cat. No.	Station.	North latitude.	West longitude.	Depth.
		° ′	° ′	*Fathoms.*
9031	937	37 49	69 49	616
10776	2549	39 51	70 17	571
9038	2215	39 48	70 31	578
9038	2216	39 47	70 30	963
11755	2691	39 37	71 08	835
9023	2206	39 35	71 24	1,043
9033	2201	39 39	71 35	538
9021	2030	39 29	71 43	588
9022	2179–80	39 30	71 50	510–523
9008	2181	39 29	71 46	693
9029	1049	38 28	73 22	435

The capitulum is quite compressed, somewhat triangular, widest near the base, its width about two-thirds the length. The occludent margin is nearly straight, the carinal convex.

The scutum is calcified in two segments at right angles. The occludent segment is lanceolate; the basal segment is much broader, subtriangular, nearly two-thirds the length of the occludent segment, its upper margin straight.

The tergum is quite small, somewhat claw-shaped, the basal margin rounded, the upper portion tapering, hooked towards the occludent margin, with the end acute.

The carina is moderately curved above, strongly so near the base. It is fully three-fourths the length of the capitulum. The roof is rounded and with the sides is rather wide throughout. The base is forked, the branches straight, extending about to the middle of the peduncle.

The peduncle is nearly as long as the capitulum, cylindric, and very finely, faintly wrinkled transversely.

Length of the capitulum 3.5, breadth 2.5 mm. Length of the peduncle 2.5 to 3 mm.

O. geryonophila is related to *O. mülleri* (Coker), but differs conspicuously and constantly in the shape of the lateral segment of the scutum, which is invariably short and wide in *O. geryonophila*, long and slender in *O. mülleri*. It is an abundant species, only known from the gill cavity of the crab *Geryon quinquedens*, and taken only in a rather small area off the continental slope east of New Jersey, in 435 to 1,043 fathoms. (Fig. 32*a*, *b*.)

OCTOLASMIS MÜLLERI (Coker).

1902. *Dichelaspis mülleri* COKER, U. S. Fish Commission Bulletin for 1901, pp. 401–412 (Beaufort, North Carolina, on *Callinectes sapidus*).

Locality.—Cat. No. 43100, U.S.N.M., Cameron, Louisiana, on gills of *Callinectes sapidus* (Ord). R. P. Cowles.

This species has been well described and figured by Mr. Coker from specimens taken at Beaufort, North Carolina. I have found it on the gills of an undetermined crab taken in Lake Worth Inlet, Florida. One of these is drawn in fig. 32 *c*. It is apparently restricted to shallow water crabs, as *O. geryonophila* is to those of deep water.

OCTOLASMIS FORRESTI (Stebbing).

1904. *Trichelaspis forresti* STEBBING, Annals and Mag. of Nat. Hist., 6th ser., XIII, p. 444, pl. xv, May, 1894.

1905. *Dichelaspis forresti* Stebbing, GRUVEL, Monographie des Cirrhipèdes, p. 132.

Locality.—Summerland Key, Florida, in the gill cavity of *Palinurus argus*, H. A. Pilsbry, March, 1907. (See fig. 32*d.*)

No more definite locality than "West Indies" has hitherto been given for this species. Its host lives in quite shallow water, 2 or 3 feet. (Fig. 32*d.*)

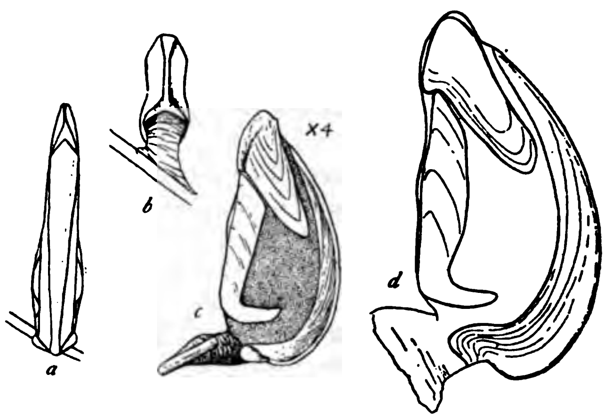


FIG. 33.—OCTOLASMIS AMERICANUM. *a*, *b*, *c*, CARINAL, BASAL, AND LATERAL VIEWS OF THE TYPE; *d*, LATERAL VIEW OF AN OLD INDIVIDUAL. × 4.

Subgenus DICHELASPIS Darwin.

OCTOLASMIS AMERICANUM, new species.

Type.—Cat. No. 32892, U.S.N.M.

Type-locality.—*Albatross* Station 2041, between Cape May and Nantucket Island, north latitude 39° 23′, west longitude 68° 25′, in 1,608 fathoms, globigerina ooze, with No. 9057.

Other localities.—No. 11860, *Albatross* Station 2709, between Cape Breton and Nantucket, north latitude 40° 07′, west longitude 67° 54′, in 866 fathoms.

The capitulum is semicordate, about twice as long as wide, the occludent margin straight, carinal margin very convex, especially near the base.

The scutum consists of two straight branches at right angles, an occludent and a lateral portion. The lateral branch does not much

exceed one-third the length of the occludent, and is somewhat narrower, tapering to a blunt end. It joins the upright portion in a short curve. The occludent branch is nearly parallel-sided, but is a trifle wider in the middle. The summit or tergal border is oblique, close to the tergum.

The tergum is triangular, with the umbo on the carinal side, midway between the summit of the plate and the apex of the carina. A furrow runs from the umbo to the baso-occludent angle, opposite the apex of the scutum, where there is a slight notch. The occludent margin is convex; summit somewhat obtuse. The basal and carinal margins are nearly straight, the basal angle of the plate somewhat obtuse.

The carina is very strongly arched basally, less so toward the upper end. The roof is flat, and at the upper end as wide as the plate, tapering to a narrow keel at the base. The sides are broader than the roof, but taper upward. The base forms a broadly crescentic cup, half embracing the top of the peduncle, but the horns of the crescent are very short (fig. 33*b*, basal view).

The peduncle is very short, attached to the axis of a slender hydroid.

Length of the capitulum of the type, 8 mm.; width, 3.6 mm. Length of capitulum of No. 11860, 11 mm.; breadth, 5.7 mm.

This species is based upon two specimens, one of them, No. 11860, being evidently a quite old individual in which the carina is wider (fig. 33*d*). It is related to *Dichelaspis sessile* Hoek from off the Azores in 1,000 fathoms, but in that the scutum is decidedly broader. *Octolasmis hawaiense* is an allied form, in which the curve joining the two branches of the scutum is longer. (Figs. 33.)

OCTOLASMIS HAWAIENSE (Pilsbry).

1907. *Dichelaspis hawaiensis* PILSBRY, Bulletin of the Bureau of Fisheries, XXVI, p. 184, pl. IV, fig. 5.

Localities.—Cat. No. 32893, U.S.N.M., *Albatross* Station 3810, off the south coast of Oahu, 211–253 fathoms; also No. 32894, *Albatross* Station 4081, off Puniawa Point, Maui, 202–220 fathoms.

The capitulum is strongly compressed, about twice as long as wide, with nearly straight occludent and convex carinal margin.

The scutum is boomerang shaped, forming a narrow band along the occludent margin and another obliquely across the base, the two straight portions being united by a curve. The occludent portion is slightly wider than the lateral, obliquely beveled above to a point, which is received in a notch of the tergum. The lateral portion is about half the length of the occludent, and extends more than half way across the side, above the incurved base of the carina.

The tergum is subtriangular in general outline. Its occludent mar-

gin is nearly straight, the carinal margin a little concave, the apex obtuse, truncated. A groove runs near and parallel to the occludent margin, terminating in a notch which receives the apex of the scutum.

The carina is very long, reaching nearly to the apex of the tergum. It is well arched throughout, and near the base is very strongly curved in, extending more than half way across the base of the capitulum, terminating in a slight expansion of the sides, partially clasping the peduncle, but not forked. The roof is slightly flattened in the upper part. The sides are wide in the lower two-thirds, tapering near the apex.

The peduncle is very short.

Length of capitulum, 5; breadth 2.25 mm.; length of the carina, 4.7 mm.; length of peduncle, 0.7 mm.

This species is related to the west Atlantic *O. americanum*, but differs in the shape of the scutum and the narrow, somewhat convex roof of the carina. Like other free-living species, it has the valves better developed than most of the forms living on the gills of crabs.

Nine specimens examined, the type lot of four individuals, the largest with capitulum 6.5 mm. long; one 5 mm. long and a very young one from Station 3810; and two of about equal size—capitulum 4.5, peduncle about 1.2 mm. long, from Station 4081.

A new description of a specimen from Station 3810 is given, the station number of the lot originally described having been lost, and the exact locality therefore unknown.

Subfamily ALEPADINÆ.

Plates varying from five, much reduced, to none; when present the umbones of scutum and carina are median or above the middle.

This group includes the genera *Conchoderma*, *Heteralepas*, *Alepas*, *Anelasma* and *Chætolepas*. From the shape of the vestigeal scutum and carina and the position of their umbones, it seems likely that the unknown fully armored progenitors of these nude or nearly nude forms were quite unlike *Lepas*, *Pœcilasma*, or other allied pentaspidian genera. The cirri have spines arranged in a single continuous or interrupted whorl on each segment in *Alepas* and *Heteralepas*, but in *Conchoderma* the spines stand comb-like along the anterior side, as in *Scalpellum*, etc. The taxonomic value of this character remains to be determined. It has not yet received careful study in any large series of species.

Genus CONCHODERMA Olfers.

1814. *Conchoderma* Olfers, Der Gesellschaft naturforschender Freunde zu Berlin, Magazin für die neuesten Entdeckungen in der gesammten Naturkunde, Jahrg. VIII, drittes Quartal, 1814, p. 177, first species *C. virgatum*.

Otion of some authors.

Nude cirripedes, with the peduncle long, capitulum generally striped or maculate, with two to five small vestigeal widely separated plates; scutum at base of the orifice, two or three lobed, with the umbo near the middle on the occludent border; carina narrow arched, with the two ends nearly alike, umbo near the middle; sometimes it is wanting; terga small or, in adults, sometimes wanting. Lateral filaments numerous; mandibles with five finely pectinated teeth; maxillæ with distinct steps. Caudal appendages none. Cirri with the spines arranged comb-like.

Type.—C. virgatum.

These pelagic forms live on whales' "bonnets," turtles, the bottoms of ships, buoys, etc. The two species are nearly or quite world-wide in distribution. *C. virgatum* is a handsomely striped form, with the plates rather well developed, though small. *C. auritum* is readily known by the two large "ears" rising behind the positions of the terga. The terga and carina are very small, sometimes absent in adults.

CONCHODERMA VIRGATUM (Spengler).

Plate IX, fig. 1.

1790. *Lepas virgata* SPENGLER, Skrifter Naturh. Selskabet, I, pl. VI, fig. 9.
1851. *Conchoderma virgata* DARWIN, Monograph on the Cirripedia, Lepadidæ, p. 146.
1883. *Conchoderma virgatum* HOEK, Challenger Rep., Cirripedia, p. 55.

Localities.—Swansea, Wales, Jeffreys collection. No. 1623, Woods Hole, Massachusetts, U. S. Fish Commission. No. 12905, Woods Hole, Massachusetts, on bottom of ship from Swan Island, Caribbean Sea. Twelve miles southeast of Block Island, Rhode Island. Off Gay Head, Marthas Vineyard, on *Mola rotunda*, U. S. Fish Commission. No. 12013, *Albatross* Station 2713, between Nantucket and Cape Charles, on *Neptunus sayi*. No. 14139, Gloucester, Massachusetts, on bottom of ship from Mediterranean. No. 4272, San Francisco, California.

CONCHODERMA AURITUM (Linnæus).

Plate IX, fig. 2.

1851. *C. aurita* LINNÆUS, Darwin, Monograph on the Cirripedia, Lepadidæ, p. 141.
1872. *Otion stimpsoni* DALL, Proc. Cal. Acad. Sci., IV, p. 301.

Localities.—Atlantic: Swansea, Wales, Jeffreys collection. Woods Hole, Massachusetts, on bottom of a bark from Swan Island, Caribbean Sea. Cape Hatteras, from an iron buoy.

Bering Sea: Plover Bay, Siberia, on *Coronula diadema* from the throat of a humpback whale. W. H. Dall, 1865.

The specimens from Plover Bay, eastern Siberia, are those Doctor Dall referred to[a] as blotched with rose pink. They were taken from a humpback whale (*Megaptera versabilis* Cope) captured by Captain Redfield. I have seen no specimens from the coast of California.

[a] Proc. Cal. Acad. Sci., IV, 1872, p. 301.

Genus HETERALEPAS Pilsbry, new genus.

1851. *Alepas* DARWIN, Monograph on the Cirripedia, Lepadidæ, p. 156, exclusive of *A. parasita*.

Nude barnacles, with the muscular layer of the peduncle continued within the integument of the capitulum; scuta absent, or minute and chiefly chitinous; no other plates developed. Cirri long, many jointed, of the usual curved form, with spines in tufts on the distal ends of the segments. Jointed caudal appendages present. Attached to objects on the bottom.

Type.—*H. rex* (Pilsbry).

This genus comprises all the species referred to *Alepas* by Darwin, Hoek, Aurivillius, Gruvel, Annandale, and other authors, with the exception of *A. parasita* Rang, the type of *Alepas*. The type of *Heteralepas* is a large Hawaiian species originally described as *Alepas rex*.

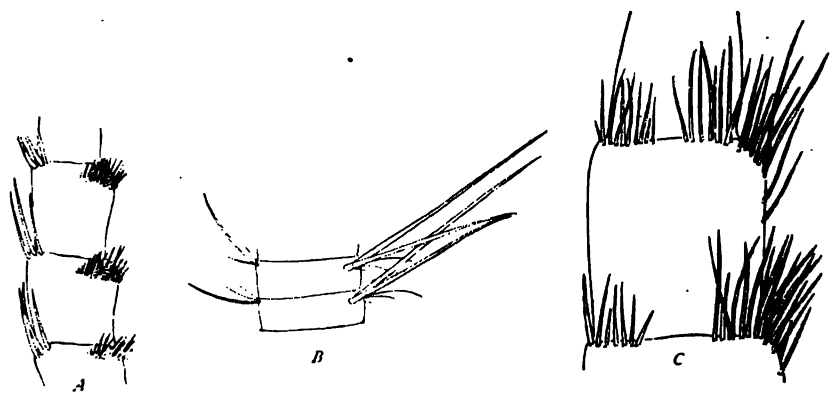


FIG. 34.—SEGMENTS FROM THE 6TH CIRRUS OF (A) PARALEPAS PERCARINATA, (B) HETERALEPAS REX, AND (C) ALEPAS PACIFICA

Heteralepas consists of two series of species, which will probably be separated eventually as distinct genera.

In typical *Heteralepas* the inner rami of cirri v and vi are greatly reduced in size and number of segments, with the spines of the anterior border atrophied, small and weak. The outer rami of cirri v and vi, and both in cirri ii to iv, are very long, composed of extremely numerous short segments, each armed with two or three very long spines and three or two minute ones at the anterior distal angle, and a group of several small spines at the posterior distal angle (fig. 34*B*, two intermediate segments of cirrus vi of *H. rex*).

In the new subgenus *Paralepas* the cirri ii to vi have subequal rami of comparatively few segments, each armed with a semicircular brush of many short spines on the anterior face and a group of several (about three) long stout spines at the posterior distal angle of each

segment (fig. 34*A*, 13th and 14th segments of outer ramus, cirrus vi, *H. pcrcarinata*, type of the subgenus *Paralepas*).

The armature of the cirri in *Paralepas* is much like that of *Alepas*, but the whorls of spines are more broadly interrupted on the sides of the cirri, and the cirri themselves are much better developed. Moreover, caudal appendages are well developed in *Paralepas*, composed of several segments, as in *Heteralepas*, while in *Alepas* they are wanting or composed of a single short segment.

Heteralepas (*Paralepas*) *pedunculata* Hoek, reported as taken by the *Challenger* at Station 164 A, off Sydney, New South Wales, on a spine of *Phormosoma hoplacantha* Agassiz, is probably not from Australian waters, but from a mid-Atlantic station. See under *Megalasma gracile*, p. 89. *Heteralepas* (*Paralepas*) *minuta* (Philippi) is in the Museum from the Zoological Station at Naples.

The following forms have been described from Antillean waters:

Heteralepas cornuta (Darwin), St. Vincent.

Heteralepas lankesteri (Gruvel), Mona Channel.

Heteralepas belli (Gruvel), coast of Cuba.

HETERALEPAS CYGNUS, new species.

Type.—Cat. No. 32920, U.S.N.M.

Type-locality.—Monterey, California, Ward's Natural Science Establishment. Depth and nature of support unknown.

The capitulum is oval, its width about three-fourths of the length, not much compressed, the diameter being about half of the length; distinctly differentiated from the peduncle, strongly keeled dorsally, integument transversely wrinkled, without hairs or bristles. The orifice is ovate, somewhat exceeding one-third the length of the capitulum. The occludent margin below the orifice is convex.

The peduncle is very long, about three times the length of the capitulum, cylindric, conspicuously wrinkled transversely, widest near the base, tapering slowly to about two-thirds the greatest width at the neck where it joins the capitulum. Along its dorsal side a low ridge continues the keel of the capitulum.

The color is light yellow, sometimes a shade darker, slightly brownish, on the peduncle.

Length of capitulum 23, breadth 18, diameter 12.5 mm. Length of the peduncle 70 mm., breadth near the base 12.5, near the capitulum 8 mm. (Fig. 35.)

The mandible (Plate V, fig. 8) has four strong subequal teeth, the lower three equally spaced, the upper one separated by a space nearly twice the width of the others. There is a brush of fine hairs on the upper edge, another on the lower.

The maxilla (Plate V, fig. 7) has the border excavated below the two large spines at the upper angle, the embayment armed with but few

small spines. The lower half is closely spinose. There is a large hairy area at the lower angle, and a small one on the upper border.

The first cirri have very unequal branches, of 14 and 29 segments, respectively. They are densely armed with whorls of slender spines. The rest of the cirri are very long and slender, with spines on the anterior side, two or three in each group being large. Distally there are groups of small spines on the posterior side also. The general arrangement of these spines conforms to that described in *H. rex*. The rami are subequal in cirri ii, iii, and iv, but in v and vi the endopod is greatly reduced, about half as long as the exopod, very slender, and composed of 28 segments in the fifth cirrus (Plate V, fig. 13), 25 in the sixth.

The terminal appendage (Plate V, fig. 12) is nearly 4 mm. long, about one-seventh the length of the sixth cirrus, composed of eight or nine segments, and without bristles.

FIG. 85.—HETERALEPAS CYGNUS, NATURAL SIZE.

The long penis is closely annulate, acuminate at the distal end, where it bears a minute pencil of delicate hairs.

This species is related to *Heteralepas indica* (Gruvel) described from Singapore, and *H. gigas* Annandale, which have the peduncle similarly lengthened. In all other known forms the peduncle is very much shorter. *H. indica* differs from *H. cygnus* by its much compressed capitulum, not distinctly separated from the comparatively wider peduncle; by its dark chestnut, slightly vinous color, the smoother cuticle of the capitulum, which has a few small tactile bristles ("*soies sensitives*"), and by the different arrangement of spines on the cirri. The terminal appendage in *H. indica* has twelve segments, the last four bearing bristles, and terminating in a bunch of bristles, whilst in *H. cygnus* there are but eight or nine segments, none of them setose. The mandible in *H. cygnus* has more slender teeth, with a fringe of bristles on the lower margin, wanting in *H. indica;* and the penis is more conspicuously and closely annulated.

Heteralepas gigas (Annandale)[a] is a larger species than *H. cygnus*, with the peduncle similarly lengthened. It has "short, stout hairs scattered singly" on the capitulum, and large, feebly differentiated scuta, thereby differing from *H. cygnus*.

[a] *Alepas gigas* Annandale, Mem. Asiatic Soc. of Bengal, I, 1905, p. 80. Bali Straits, 160 fathoms.

Heteralepas quadrata (Aurivillius), from Lower California, on *Lepas*, is the only species of this genus hitherto reported from the west coast of North America. It was described as an *Alepas*, and is known to me by the original account only.

HETERALEPAS (PARALEPAS) PERCARINATA (Pilsbry).

1907. *Alepas percarinata* PILSBRY, Bulletin of the Bureau of Fisheries, XXVI, p. 185, pl. IV, fig. 8.

Localities.—This Hawaiian species is represented by specimens from *Albatross* stations 4081, 4082, 4083, 4084, all off the north coast of Maui in 202 to 267 fathoms; Station 3835, south coast of Molokai, 169 to 182 fathoms, and Station 3912, north coast of Molokai, 334 fathoms. The bottom temperature ranges from 43° to 55° F. These stations are additional to those mentioned in the original description.

Genus ALEPAS Rang.

1829. *Alepas* SANDER RANG, Manuel de l'histoire naturelle des Mollusques, p. 364, for *A. parasita* Rang (May, 1829). Not *Alepas* of subsequent authors.

1894. *Gymnolepas* AURIVILLIUS, Kongliga Svenska Vetenskaps-Akademiens Handlingar, XXVI, No. 7, p. 33, type, *G. pellucida*. Not *Gymnolepas* Blainville, 1824.

1897. *Eremolepas* WELTNER, Archiv für Naturgeschichte, Jahrg., 1897, I, p. 239, substitute for *Gymnolepas* Aurivillius.

Nude pedunculate barnacles with the integument of the capitulum very thin, without an internal muscular layer, and typically having a pair of very small, irregularly lobed, imperfectly calcified scuta; cirri nearly straight, very short, and weak, the rami with 6 to 12 segments, each segment armed with a continuous or interrupted circle of spines. Caudal appendages wanting or of one short joint. Penis hairy. Pelagic, attached to medusæ.

Type.—*A. univalvis* Quoy and Gaimard.

The type of this genus, *Alepas univalvis*, is known solely by the insufficient description of Quoy and Gaimard,[a] published more than

[a] 1827. *Anatifa univalvis* QUOY and GAIMARD, Annales des Sciences Naturelles, X, Zoologie, p. 234, pl. VII, figs. 8, 8*a*. Strait of Gibraltar.

1829. *Alepas parasita* RANG, Manuel de l'Hist. Nat. des Moll., p. 364, pl. VIII, fig. 5, based on the same specimens.

1834. *Anatifa parasita* QUOY and GAIMARD, Voyage de l'Astrolabe, Zoologie, III, p. 641, pl. XCIII, figs. 1–3.

——. (?) *Triton* (*Alepas*) *fasciculatus* LESSON, Voyage autour du Monde de La Coquille, Zoologie, II, Pt. 1, p. 442, pl. XVI, fig. 6.

1851. *Alepas parasita* RANG, Darwin, Monograph on the subclass Cirripedia, Lepadidæ, p. 163.

Lesson's figure is very poor, and does not agree with the description. If the cirri are correctly figured, a species different from *A. univalvis* is indicated.

three-quarters of a century ago. The later accounts in the monographs of Darwin and Gruvel are compiled from Quoy and from Lesson, who described a similar form, perhaps specifically identical. According to Quoy, the tunic is gelatinous and diaphanous; the cirri are short, quite broad, and straight, white (though colored blue on the plate in the *Astrolabe* voyage), and composed of about 10 segments. An isolated cirrus figured shows rami with 12 segments. The total length is nearly 2 inches. Nothing is said of caudal appendages.[a]

This account, so far as it goes, applies so well to the Pacific species described below that I can not doubt that the two forms are very closely related and possibly identical specifically. It is, moreover, evident that *Gymnolepas pellucida* Aurivillius, based upon a specimen about 1 inch long, is closely related to *A. univalvis*, though probably distinct specifically. The genus will therefore include three species:

Alepas univalvis (Quoy and Gaimard). Eastern Atlantic.

Alepas pellucida (Aurivillius). North Atlantic.

Alepas pacifica Pilsbry. Eastern Pacific.

Alepas, as here restricted, differs from the genus *Heteralepas* by its thin-walled integument, the absence of segmented caudal appendages, and by the short, few-jointed, and weakly chitinized cirri. These are adaptive characters, correlated with pelagic conditions.

The arrangement of spines on the cirri is much alike in *Alepas* and *Paralepas*. In *A. pacifica* there is, on the more anterior cirri, a complete circle of spines around the distal end of each segment. On the last two or three cirri the circle is more or less interrupted, both on the outer and inner faces of the rami. This is most pronounced in the sixth cirrus, the fifth segment of which is illustrated in fig. 34 *C*, page 100. Except that the first cirrus is more profusely spinose along the anterior side, it does not differ in armature from the adjacent cirri. Aurivillius has figured a cirrus of his *Gymnolepas pellucida* with the same arrangement of spines described above for *A. pacifica*.

---

[a] Darwin *infers* the presence of "a pair of long articulated caudal appendages" from Lesson's statement that his *Triton* (*Alepas*) *fasciculatus* has seven pairs of cirri. In no allied form are the caudal appendages so large as to be mistaken for cirri, and it is far more probable that Lesson miscounted the cirri—a mistake very easy to make where they lie limp and tangled, as I have noticed in *A. pacifica*. The inference that *A. univalvis* (*A. parasita*) has caudal appendages depends, moreover, upon the identity of the form badly described by Lesson with that of Quoy and Gaimard—a proposition which can not be considered as demonstrated. In Gruvel's monograph Darwin's *inference* as to presence of caudal appendages is adopted as a matter of fact.

ALEPAS PACIFICA, new species.

Type.—Cat. No. 28797, U.S.N.M.

Type-locality.—Sea north of San Francisco, California, taken from a jelly fish, March 26, 1894, Stanford University.

The capitulum has thin walls, collapsing in alcohol. The occludent margin is straightened, slightly protruding along the orifice, the carinal margin regularly arched. The width of the capitulum is about two-thirds its length. At the base of the orifice there is a pair of imperfectly calcified, rather indistinct white scuta. So far as can be made out, each consists of a narrow band along the occludent border, with two narrow divergent lateral lobes. The orifice is ample, occupying a little more than half the length of the capitulum. It is continued as a superficial slit in the outer tunic nearly to the base. The integument is smooth, of a dull grayish-buff tint, and, while somewhat thickened along the dorsal border, there is no keel or angle there. No tubercles, hairs, or tactile organs of any kind are visible.

The peduncle is shorter than the capitulum, oval in section, but collapsing in the alcoholic specimens, tapering slightly toward the base of attachment. Its integument is nearly smooth and colored like the capitulum.

Length of capitulum 36, greatest width 25 mm. Length of the peduncle 20, width in the middle 11 mm.

The mandible (Plate V, fig. 2) has six teeth, counting the lower point. The upper tooth is acuminate and curved; the rest are of the usual shape, the lower ones smallest. There is some short pubescence upon the lower teeth and on the margin below them.

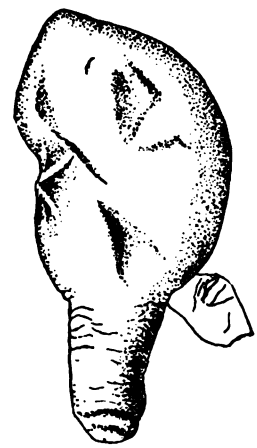


FIG. 36.—ALEPAS PACIFICA, NATURAL SIZE.

The maxilla (Plate V, fig. 1) is peculiar. There is a single large spine at the upper angle and a deep excavation of the edge below it. The rest of the edge protrudes and is irregularly spinose, the spines being very short. There is some fine and short pubescence at the lower angle.

The cirri are all short, the first (Plate V, fig. 5) with shorter, more lanceolate rami than the others. All have whorls of delicate bristles, longer and more numerous on the anterior side (Plate V, fig. 4, third cirrus). The second to fifth cirri are of about equal length, the sixth longer. The rami of cirrus i are composed of 6 and 7 segments, ii and iii of 8, iv and v of 10, vi of 10 and 12 segments.

The penis (Plate V, fig. 6) is stout and short, with only weak annulation, chiefly in the median portion, and it is clothed with rather long delicate hairs, which seem to be irregularly placed.

The imperfectly calcified scuta are shaped much like those of *Conchoderma virgatum* var. *hunteri*, but with an additional diverging lobe or ray below. Owing to the absence of definite outlines, the shape of the plate is not clearly to be seen.

The type is a large individual, with a young one adhering at the base of the capitulum. Several other smaller examples were taken with it. *A. pacifica* is a much larger form than *A. pellucida* (Aurivillius) of the Atlantic. The integument is also less transparent. The arrangement of the teeth of the mandible is different, those of *A. pacifica* being more equally spaced, without a wider space below the upper spine. The maxillæ also are unlike in the Atlantic and Pacific species, that of *A. pacifica* being remarkable for the very short spines and the very irregular edge.

A. pacifica must be compared with *A. univalvis* (Quoy and Gaimard) of the eastern Atlantic. That form is at present known only by very inadequate descriptions and figures, and its exact structure remains to be investigated. From existing data it seems to be very similar to the Pacific form; yet the specific identity of forms so widely separated geographically could not prudently be affirmed without a comparison with Atlantic material. The essentially pelagic habit of the genus leads us to anticipate wide dispersion of the species, limited only by the distribution of the large medusæ which serve as their hosts. (Fig. 36.)

Family VERRUCIDÆ Darwin.

Sessile, box-like, asymmetrical barnacles, in which the wall is composed of the rostrum, carina, a scutum, and a tergum, immovably interlocked, and all much specialized in shape; the other scutum and tergum are movable, forming the lid-like top. Caudal appendages are very long, composed of numerous segments.

This very distinct family consists at present of a single genus.

Genus VERRUCA Schumacher.

1817. *Verruca* SCHUMACHER, Essai d'un nouv. syst. Vers Testacés, p. 91.
1851. DARWIN, Monograph on the Cirripedia, Balanidæ, p. 496.

Doctor Hoek, in describing the deep-water species obtained by the *Challenger*, has commented upon the similarity of the several forms, and expressed grave doubts as to their specific value. Individuals are much rarer than in *Scalpellum* or *Pœcilasma*, most of the forms being known by only one, or at best by very few examples, so that we have little opportunity to ascertain the ordinary range of individual variation. The characters of sculpture upon which the species are largely

based, change somewhat with age, and without a series of specimens it is often difficult to tell whether a form in hand is young or mature. The general contour is certainly affected by the shape of the supporting surface; and any species may occur with the movable valves on either the right or left side. Gruvel and Aurivillius have described a considerable number of forms, many of them very closely related, from the eastern Atlantic; so that the study of *Verruca* is now by no means a light task.

Among the species taken in the western Atlantic and Antilles by the *Albatross* I have been able to recognize only one previously described form, the *Verruca nexa* of Darwin, which was taken at one station off Habana. The forms described below as *V. euglypta* and *V. calotheca* belong to a group of closely related species or races, widespread in deep water, yet they present minor features which bar their identification with any forms hitherto described and figured. *Verruca darwini* stands near *V. nitida* Hoek, from the Moluccas; *V. hoeki*, on the other hand, is quite distinct from other described species.

No other forms of this family are known from North American waters.

VERRUCA NEXA Darwin.

Locality.—Cat. No. 9496, U.S.N.M., *Albatross* Station 2324, north latitude 23° 10′ 25″, west longitude 82° 20′ 24″, off Habana, Cuba, in 33 fathoms.

In some of the specimens there are strong vertical ribs on the fixed scutum and tergum, while in others of the same group the wall on that side is nearly smooth.

VERRUCA NEXA ALBA, new subspecies.

Plate XI, figs. 7, 8.

Type.—Cat. No. 9474, U.S.N.M.

Type-locality.—*Albatross* Station 2317, Straits of Florida, north latitude 24° 25′ 45″, west longitude 81° 46′ 45″, in 45 fathoms on a sea-urchin spine.

This form resembles *V. nexa* in size and general shape of the plates, but the movable scutum is convex between apex and basal margin, the former being depressed and somewhat twisted; the two articular ridges are weaker. The rest of the plate has three strong, slightly beaded radial ribs. The movable tergum has four articular ridges, the second one very small. The apices of the fixed scutum and tergum are produced in short, stout beaks. Both carina and rostrum have several short, curved ribs terminating on the hinge-line of the movable plates, and each has one very large articular rib, ending in a long interlocking tooth. The shell is white. Length 4, breadth 2.7, altitude 1.7 mm.

Another specimen on the same spine has four strong, subequal

radial ribs on the movable scutum, exclusive of the articular ribs, and the second articular rib of the movable tergum is nearly as large as the others. In other characters, especially in the convex scutum, it agrees with the type-specimen.

In a number of examples of *V. nexa* Darwin which I have examined, the movable scutum is flat, and the articular ribs and interlocking teeth of carina and rostrum are more numerous and subequal. Probably *V. n. alba* might better be considered a distinct species; yet with only two examples I prefer to rank it as a subspecies. The produced beaks of the fixed scutum and tergum, densely marked with growth-lines, give reason for believing the individuals quite adult. The shell is white, like most other Verrucas, not ruddy like all of the *V. nexa* I have seen.

VERRUCA EUGLYPTA, new species.

Plate X, figs. 1, 2, 3.

Type.—Cat. No. 32906, U.S.N.M.

Type-locality.—*Albatross* Station 2415, off South Carolina, latitude 30° 44′ north, longitude 79° 26′ west, in 440 fathoms, bottom temperature 45.6° F.

The shell is cream-white, seated transversely upon a branch of Oculina-like coral, much narrower than the barnacle, the base of which is consequently contracted, the end walls overhanging. The scuto-tergal wall is vertical, the rostro-carinal wall slopes steeply. The movable scutum and tergum lie at an angle of about 45° with the plane of the base. All of the plates are very deeply and closely sculptured with riblets in the direction of growth-lines, wider than the intervening furrows.

The movable scutum is subtriangular, curved, with the surface divided into two areas. The larger occludent area is sculptured with transverse riblets, the smaller area with four arcuate articular ridges. The first ridge is smooth, and about one-third the length of the plate; the other ridges are cut by the transverse riblets, the second articular ridge being narrowest and not reaching quite to the apex; hence a quite young individual would have but three articular ridges. The furrows between the ridges are smooth.

The movable tergum is much larger than the scutum, quadrangular, the occludent margin somewhat shorter than the basal and parallel to it, the carinal margin slightly arcuate, the articular margin coarsely zigzag. The surface is divided into two nearly equal areas by the slightly curved diagonal last articular ridge, the area below it being depressed, flat, and marked with transverse riblets only. There are four articular ridges, the third narrowest, the fourth widest and in strong relief. All are sculptured with the transverse riblets, but on the first ridge they are very low, fine and delicate, and arch down-

ward, while on the others they are straight and wide. They are prominent, oblique, and lamellar in the first articular furrow, less conspicuous in the others. The second and third articular ridges unite near the apex, so that in a quite young stage there are but three articular ridges, of about equal width.

The fixed scutum is divided into two nearly equal large areas, and a third very narrow area next the tergum. The rostral area is regularly sculptured with plain transverse riblets. The median area is triangular, raised above the others, with the transverse sculpture irregular, rude, and interrupted by a number of irregular radial grooves or indistinct sulci. Near the base it articulated with the rostrum by a single tooth. The tergal area is a very narrow obliquely costulate segment not reaching to the base and separated from the median area by a deep furrow.

The fixed tergum stands erect, surrounding two sides of the movable tergum, as viewed from above, hence its scutal and carinal walls stand at right angles. Its surface is divided into three areas. The scutal and carinal areas are triangular, reaching only about halfway to the base, and are regularly sculptured with obliquely transverse riblets. The median area stands in high relief, extends to the base, and has wide, rather rude, and flat transverse sculpture, the grooves being linear and shallow. There is a poorly developed articular ridge along the carinal edge of the plate.

The carina is bent so that its two faces stand at right angles. A broad rostral triangle is occupied by five radial ridges forming as many teeth articulating with the rostrum. These ridges are crossed by the transverse sculpture. Three of them extend to the apex of the plate, the others being shorter and peripheral, therefore wanting in the young stage. There is also a prominent radial ridge and a furrow along the other margin of the plate, articulating with the fixed tergum. The intermediate area, comprising a moiety of the surface of the plate, has a rude sculpture of wide, flat, transverse pleats parted by shallow linear grooves.

The rostrum is like the carina in general shape. On its carinal face there are five radial ridges, of which two or three arise at the apex, the second ridge being widest. The rest of the plate has rude, flat sculpture like that of the carina. Near the fixed scutum there are several radial grooves and furrows. The apex of the rostrum projects more than that of the carina.

Greatest carino-rostral length 11.2 mm.; greatest breadth (at right angles to length) 9.4 mm.; height from base to apex of the fixed tergum 7.8 mm.

This fine species is related to *V. radiata* Gruvel,[a] described from

[a] Exped. Sci. du Travailleur et du Talisman, Cirrhipèdes, p. 94, pl. II, figs. xix, xx.

an individual only 3 mm. long, but it differs by the better developed articular ridges of the movable scutum, which in *V. radiata* occupy a comparatively much narrower portion of the surface; by the less curved ridges of the movable tergum, the weak radial grooves of the fixed scutum, etc. *V. euglypta* of the same size as the type of *V. radiata* would evidently be quite unlike that species.

The rostrum, carina, fixed scutum, and fixed tergum, when the plates are detached, are seen to be conspicuously vaulted or decked over near the beaks. No such structure is seen in *V. calotheca*, in which the plates are simple inside.

VERRUCA CALOTHECA, new species.

Plate XI, figs. 1, 2, 3.

Type.—Cat. No. 32907, U.S.N.M.

Type-locality.—*Albatross* Station 2415, north latitude 30° 44′, west longitude 79° 26′, 440 fathoms, on *Scalpellum superbum*.

The shell is white, depressed, with subcircular base, slightly wider than long; end walls vertical; carino-rostral wall sloping outward, the opposite (scuto-tergal) wall overhanging. The movable scutum and tergum lie nearly parallel to the plane of the base.

The movable scutum is subtriangular, its surface divided into two areas of nearly equal size. The outer area is sculptured with wide transverse ribs parted by much narrower interstices. The tergal area has four arcuate articular ridges, the middle two deeply cut into transverse tubercles; fourth rib narrower and less deeply sculptured; first rib delicately striate transversely.

The tergum is quadrangular, the upper margin shorter than the basal, the carinal margin arcuate. The surface is divided into two subequal areas, the carinal area transversely ribbed. Scutal area sculptured with four articular ribs, the first finely sculptured with thin arcuate transverse lamellæ, the other ribs transversely cut into tubercles, which have the imbricating appearance of roof tiles. The second rib is the smallest, and hardly reaches to the apex, which is somewhat recurved. The furrow between the first and second ribs is wider than the others.

The fixed scutum is quadrangular, with parallel upper and basal margins. The apex is somewhat recurved and produced. A diagonal rib from the apex divides the surface into equal triangles. The upper or occludent triangular area is sculptured with irregular, rather widely spaced, vertical grooves and two shallow radial furrows. The lower area has a rather rude, irregular, and weak sculpture of grooves parallel to the base. The tergal margin is straight and vertical.

The fixed tergum is very irregular in shape. The surface is radially divided into three areas, the middle one triangular and raised, without distinct sculpture. The scutal area is sunken, rather narrow, and very obliquely, finely costulate. The carinal area is wide, obliquely

triangular, and sculptured transversely with rather widely spaced grooves, which are waved downward near the sides of the area. The base of this area is formed by the carina.

The carina has a recurved, overhanging apex. The surface is divided into two areas, that below the beak being concave and weakly, irregularly wrinkled parallel to the base. The rostral area is sculptured with four slightly curved oblique ribs, the upper one much the largest, the lower one very small. These ribs have roof-tile-like sculpture, and their ends interlock with those of the rostrum. The furrow between the first and second ribs is much wider than the other furrows.

The rostrum is shaped much like a mirror image of the carina, but the wall below the beak is vertical, not concave, and there is a ledge above, with two beaded radial ribs curving toward the movable scutum. Below this ledge there is a very strong rib articulating at the end with the carina, and below it two minor ribs, all transversely grooved, the grooves narrow, intervals not much raised. The rest of the plate has irregular wrinkles parallel to the base.

Greatest carino-rostral length, 5.9 mm.; width at right angles to length, 4 mm.; height from base to apex of the fixed tergum, 3 mm.

This species differs from others having the movable plates parallel to the base by the sculpture of four articular ribs, other species of similar form having three or five ribs. *V. calotheca* was taken at the same station as *V. euglypta*. It differs from that species conspicuously in the flat top and the shape and sculpture of the plates forming the wall and in the simple, open interior. In *V. euglypta* the plates of the wall are vaulted toward their apices inside.

VERRUCA DARWINI, new species.

Plate X, figs. 4–7, 8.

Type.—Cat. No. 9015, U.S.N.M.

Type-locality.—*Albatross* Station 2042, east from Cape May, north latitude 39° 33′, west longitude 68° 26′ 45″, in 1,555 fathoms.

The shell is white, much elevated, seated lengthwise on the slender spine of a sea urchin; the base therefore is long and narrow, partially clasping the spine, and the side walls overhang. The movable scutum and tergum slope steeply at an angle of about 45° with the base. All of the plates are concentrically sculptured with wide, flat pleats.

The movable scutum is sculptured with wide transverse pleats, cut by an arcuate sulcus running from apex to the baso-tergal angle, cutting off an arcuate articular ridge. The small area between this rib and the tergal margin is closely sculptured with fine riblets parallel to the latter.

The quadrangular movable tergum is divided into two areas by a well-raised, arcuate diagonal rib from apex to baso-scutal angle. The

tergal area has sculpture of wide, flat, transverse ribs parted by narrow grooves. The scutal area has pleats at right angles to those of the other area. There is a radial depression near the upper margin, and a weak elevation, hardly to be called a rib, near the lower diagonal rib.

The fixed scutum is irregularly subtriangular, with the apex curved strongly toward the tergum, not projecting; its surface is divided into three areas: the median area widest, flat, with sculpture of very wide, flat pleats, weakly, irregularly striate parallel to the pleats; the rostral area is narrow, forming part of the rostral wall, sculptured with pleats deeper than those of the median area and at right angles to them; the tergal area is very narrow, not reaching to the base, obliquely pleated, and separated from the median area by a ledge, being depressed below the level of the latter.

The fixed tergum has two faces nearly at right angles, and is divided into three areas: the scutal area is triangular, does not reach the base, and is sculptured with vertical pleats; a deep, narrow furrow separates it from the median area. The median area has sculpture of wide, flat pleats, which are angulate or V-shaped except near the apex, where they are close and straight. The carinal area has oblique pleats, sinuated where they pass over the rounded rib at the occludent margin.

The carina is quadrangular, with parallel tergal and basal margins, its surface divided by a weak diagonal groove into two triangular areas. The lower area has weak sculpture of widely spaced grooves parallel to the basal margin. The rostral area has a strong, narrow rib along the upper margin, followed by a deep furrow. Below this there are weak indications of two wide radial ribs, indicated more by the curvature of the pleats running over them than by actual elevation of the ribs themselves. The umbo projects a little.

The rostrum is quadrangular with slightly projecting umbo. It has two curved, radial articular ridges, the upper one strong, the lower low and wide. Above the upper rib there is a narrow excavated area forming a ledge along the base of the movable scutum. In this area there are a few weak radiating riblets.

Greatest carino-rostral length, 11 mm.; greatest breadth, 6 mm.; height from base to apex of the fixed tergum, 8.7 mm.

The high, compressed shape, wide, pleat-like sculpture, and steeply sloping movable valves, with only one or two articular ridges, are characteristic features. It is closely related to *V. nitida* Hoek, from the Moluccas; but it differs by being twice the size of that species, with the suture uniting rostrum and carina coarsely zigzag, with three major projections on the carina and two on the rostrum. In *V. nitida* there is a single strong upper tooth, the suture below it being straight.

There are two specimens, the type and another taken with it. The latter (Plate X, fig. 8) is shorter and wider than the type. The mov-

able scutum has two very distinct arcuate ribs. The interlocking ribs of the carina and rostrum, below the strong upper ones, are more distinct. The ledge-like area between the upper articular ridge of the rostrum and the movable scutum is much wider, with strong rib-sculpture, and two narrow curved ribs. Greatest carino-rostral length, 8.5 mm.; breadth, 6.7 mm.; height, 6.7 mm. These specimens seem to show that there may be considerable individual variation in *Verruca*, if, indeed, the differences between them are individual and not racial. In all other cases where I have been able to compare a number of examples they have proved to be very constant.

VERRUCA HOEKI, new species.

Plate XI, figs. 4, 5, 6.

Type.—Cat. No. 1493, U.S.N.M.

Type-locality.—*Albatross* Station 2750, north latitude 18° 30′, west longitude 63° 31′, Anegada Passage, in 496 fathoms, bottom temp. 44.5° F.

The shell is small, gray-white; laterally much compressed, the base narrowly oval; very high, conspicuously leaning; the movable plates lying parallel with the wall below them; sculpture very weak.

The movable scutum is small, triangular, the apex but little curved. The occludent and tergal margins curve down, the plate being thus a little convex at the sides, flat in the middle. Except for a few faint, widely spaced transverse grooves there is no sculpture.

The tergum is nearly square, the upper margin a trifle shorter than the others. It is divided into two triangles by a diagonal rib from apex to baso-scutal angle. The scutal triangle has faint sculpture of spaced grooves parallel to the scutal margin; the other area has similar faint vertical grooves. The suture between scutum and tergum is straight and simple.

The fixed scutum is quadrangular, margins straight; the side margins vertical, at right angles to the base; the upper margin slopes steeply. The apex is acute and projects a trifle. The surface is weakly marked with growth lines and faint vertical striæ.

The fixed tergum is high and narrow, five-sided. The basal margin is short, the side margins long, diverging upward. The upper margins converge to the pointed apex.

The rostrum rises to an acute, slightly recurved apex; it is curved, forming the rounded end of the wall. Three weak ribs radiate from the apex to the carinal margin.

The carina is lower than the rostrum, square, the apex acute, slightly projecting. A low rib along the upper margin terminates in a lobe indenting the suture with the rostrum, which is elsewhere an even line.

Length of the base, 3.6 mm.; length from apex of rostrum to that of carina, 3.2 mm.; greatest width of base, 1.9 mm.; oblique height from base to apex of the fixed tergum, 4 mm.

The four specimens taken are alike in the compressed shape, steeply leaning posture; and other characters described above. Three lean toward the right, as viewed from the opercular side, and one toward the left. All lean also toward the side of the fixed scutum and tergum. The narrow base and compressed shape are not due to a narrow support, for all the specimens were seated upon flat, frond-like polyzoan colonies, wider than the barnacles.

This species represents quite a distinct form of the genus, *V. obliqua* Hoek being nearer than any other, but differing in many respects. It is respectfully dedicated to Dr. P. P. C. Hoek, who ably worked up the *Challenger* Cirripedia.

BIBLIOGRAPHY.

The literature of cirripedes has been very fully worked up by Gruvel (1905) and by Alessandri (1906). It will therefore be necessary to refer only to the general works and to the most recent papers, bringing the subject up to date.

1851. DARWIN, CHARLES. A monograph on the subclass Cirripedia. The Lepadidæ or pedunculated cirripedes.

1854. ———, ———. The Balanidæ or sessile cirripedes.

In lucid systematic work and firm grasp of the morphological questions involved, these books may perhaps have been equaled, but never surpassed.

1883. HOEK, P. P. C. Report on the Cirripedia collected by H. M. S. *Challenger* during the years 1873–1876. Challenger Report, Zoology, VIII.

1902. COKER, ROBERT E. Notes on a species of barnacle (Dichelaspis) parasitic on the gills of edible crabs. U. S. Fish Commission Bulletin for 1901, pp. 399–412.

1905. GRUVEL, A. Monographie des Cirrhipèdes ou Thécostracés.

Bibliography on pp. 464–467.

1905. ANNANDALE, N. Malaysian barnacles in the Indian Museum, with a list of Indian Pedunculata. Memoirs of the Asiatic Society of Bengal, I, No. 5, pp. 73–84.

1906. ———, ———. Note on a rare Indo-Pacific barnacle. Journal and Proceedings of the Asiatic Society of Bengal, new series, II, No. 6, pp. 207, 208.

1906. ———, ———. Stalked barnacles (*Cirripedia Pedunculata*) in the Colombo Museum. Spolia Zeylanica, III, Pt. 11, pp. 193–195.

1906. ———, ———. On the Cirripedia. Report on the Pearl Oyster Fisheries of the Gulf of Manaar, supplementary reports, No. XXXI, pp. 137–149.

1906. ———, ———. Preliminary report on the Indian stalked barnacles. Annals and Magazine of Natural History, 7th ser., XVII, pp. 389–400.

1906. ———, ———. Two new barnacles dredged in 1905–6. Annals and Magazine of Natural History, 7th ser., XVIII, pp. 44–47.

1906. ALESSANDRI, G. DE. Studi monografici sui cirripedi fossili d'Italia. Palæontographica Italica, XII, pp. 207–324.

Bibliography on pp. 207–212.

1907. ANNANDALE, N. Illustrations of the Zoology of the Royal Indian Marine Survey Ship *Investigator*, Plates I, II.

1907. PILSBRY, HENRY A. Hawaiian Cirripedia, and Cirripedia from the Pacific Coast of North America. Bulletin of the Bureau of Fisheries, XXVI, pp. 179–204.

1907. GRUVEL, A. Cirrhipèdes. National Antarctic Expedition. Natural History, III, pp. 1–4.

1907. ———, ———. Cirrhipèdes operculés de l'Indian Muséum de Calcutta. Memoirs of the Asiatic Society of Bengal, II, No. 1, pp. 1–10.

EXPLANATION OF PLATES.

PLATE I.

Figs. 1–5. *Scalpellum stroemii* Sars. Series of a form from St. Peter's Bank, showing changes with age. Cat. No. 21547, U.S.N.M.

6, 7. *Scalpellum stroemii* Sars. Typical Norwegian specimen in side and ventral views.

8, 9, 10. *Scalpellum stroemii substroemii*, new subspecies, *Albatross* Station No. 2693.

11, 12. *Scalpellum stroemii latirostrum*, new subspecies. Type, Cat. No. 10780, U.S.N.M., *Albatross* Station No. 2527.

13, 14. *Scalpellum stroemii latirostrum*, new subspecies. Cat. No. 10752, U.S.N.M., *Albatross*, 1885.

15, 16. *Scalpellum stroemii latirostrum*, form having some features of *substroemii*. Cat. No. 9020, U.S.N.M.

PLATE II.

Fig. 1. *Scalpellum giganteum* Gruvel. Side view of specimen largely denuded of the cuticle, from *Albatross* Station 2658. Natural size.

2, 3. *Scalpellum regium latidorsum*, new subspecies, dorsal and lateral views of type. Natural size.

4. *Scalpellum regina*, new species. Diagrammatic section of carina.

5, 6. *Scalpellum regina*, new species. Detail of base of carina, and lateral view of type. Natural size.

7. *Scalpellum regium latidorsum*, new subspecies. Section of carina, diagrammatic.

8. *Scalpellum regium* Wyville Thomson. Section of carina, diagrammatic.

9, 10. *Scalpellum regium*, variety from Station 3342 in the Pacific. Dorsal and lateral views. Natural size.

PLATE III.

Fig. 1. *Scalpellum giganteum* Gruvel. Side view of an old specimen showing sutural lines between the imperfectly calcified plates. Natural size.

2. *Scalpellum velutinum* Hoek. Group of ten individuals. Cat. No. 12480. Natural size.

3. *Scalpellum velutinum* Hoek. Group, showing adult and young individuals in carinal aspect. Natural size.

4, 5. *Scalpellum regium* Wyville Thomson. Cat. No. 8629, U.S.N.M.

PLATE IV.

Figs. 1–5. *Scalpellum stearnsii* Pilsbry. 1, first cirrus; 2, terminal appendage; 3, segment from middle of sixth cirrus, anterior side toward the left; 4, mandible; 5, maxilla.

6–8. *Scalpellum regium* Wyville Thomson. 6, mandible; 7, lower point of same, much enlarged; 8, terminal appendage.

9. *Scalpellum aurivillii*, new species. An intermediate segment of the sixth cirrus, anterior side on the right.

10–12. *Scalpellum regium*, variety from *Albatross* Station, 3342. 10, first cirrus; 11, maxilla; 12, mandible

13. *Scalpellum aurivillii*. Terminal appendage.

14. *Scalpellum regium*, var. from Station 3342. Terminal appendage.

15–18. *Scalpellum imperfectum*, new species. 15, intermediate segment from sixth cirrus; 16, terminal appendage; 17, mandible; 18, lower tooth and lower point of same, more enlarged.

PLATE V.

Figs. 1, 2. *Alepas pacifica*, new species. Maxilla and mandible.
3. *Scalpellum aurivillii incertum*, new subspecies. Mandible.
4–6. *Alepas pacifica*, new species. Third and first cirri and penis.
7, 8. *Heteralepas cygnus*, new species. Maxilla and mandible.
9. *Scalpellum aurivillii incertum*. Maxilla.
10, 11. *Pœcilasma kæmpferi* Darwin. Maxilla and mandible of a Japanese example.
12, 13. *Heteralepas cygnus*. Terminal appendage and portion of the sixth cirrus, anterior side on the left side of the figure.
14. *Megalasma annandalei*, new species. Intermediate segment from sixth cirrus, anterior side on the right side of the figure.
15. *Scalpellum aurivillii*, new species. Mandible.
16. *Megalasma gracile gracilius*, new subspecies. Maxilla.

PLATE VI.

Figs. 1, 2. *Pœcilasma kæmpferi litum*, new subspecies. Lateral and ventral views.
3, 4, 5. *Pœcilasma kæmpferi* Darwin. Japan. Interior of scutum, interior and lateral views of carina.
6, 7. *Pœcilasma inæquilaterale*, new species. Lateral and ventral views of the type.
8. *Pœcilasma inæquilaterale*, new species. Interior of scutum of a specimen from off Key West.
9, 10. *Pœcilasma inæquilaterale breve*, new subspecies. Ventral and lateral views of the type.
11, 12. *Pœcilasma inæquilaterale*, new species. Lateral and ventral views of a topotype.
13, 14. *Pœcilasma kæmpferi novæangliæ*, new subspecies. Lateral and ventral views of the type.

PLATE VII.

Figs. 1–5. *Megalasma subcarinatum*, new species. Lateral and dorsal views of type; interior of scutum; inside and lateral views of the carina.
6–9. *Megalasma gracile gracilius*, new subspecies. Lateral view of type; interior of scutum; inside and lateral views of carina.
10–14. *Megalasma rectum*, new species. Lateral and dorsal views of type; interior of scutum; inside and lateral views of the carina.
15–19. *Megalasma annandalei*, new species. Lateral and dorsal views of the type; interior of scutum; inside and lateral views of the carina.

PLATE VIII.

Fig. 1. *Lepas anserifera* Linnæus. Cherrystone, Virginia. Length of capitulum 27 mm.
2. *Lepas hillii* Leach. Menimsha, Marthas Vineyard, Massachusetts. Diagram of base of the capitulum.
3. *Lepas anserifera* Linnæus. Longitude 90° east, on the equator. Length of capitulum 19 mm.
4. *Lepas pectinata* Spengler, spinose variety. *Albatross* Station 2379, Gulf of Mexico. Length of capitulum 9 mm.
5, 6. *Lepas pectinata* Spengler, inflated variety, carinal and lateral views. Bering Island. Length of capitulum 16 mm.
7. *Lepas hillii* Leach. Menimsha, Marthas Vineyard. Length of capitulum 35 mm.
8. *Lepas pectinata* Spengler. Vineyard Sound. Length of capitulum 12 mm.

PLATE IX.

Fig. 1. *Conchoderma virgatum* (Spengler). Woods Hole, Massachusetts. Length about 25 mm.

2. *Conchoderma auritum* (Linnæus). Cape Hatteras, on an iron buoy. Length about 83 mm.

3. *Lepas anatifera* Linnæus. Boca Chica Key, Florida, on driftwood. Length of capitulum 15 mm.

4. *Lepas anatifera*. Diagram of base of the capitulum showing the umbonal tooth (*t*) of the right scutum. Vineyard Sound, Massachusetts.

5. *Lepas anatifera*, typical form. Vineyard Sound, Massachusetts. Length of capitulum 21 mm.

6. *Lepas fascicularis* Ellis et Solander. *Albatross* Station 2425, off eastern United States. Capitulum 20 mm. long.

PLATE X.

Figs. 1–3. *Verruca euglypta*, new species. Oblique view from side of movable valves; view from side of fixed scutum and tergum, and outline of rostral end. Type.

4–7. *Verruca darwini*, new species. Views of side of movable valves, top, and from side of fixed valves, and rostral end of the type.

8. *Verruca darwini*, top view of a topotype.

PLATE XI.

Figs. 1–3. *Verruca calotheca*, new species. Top and carino-rostral views and outline of rostral end of the type.

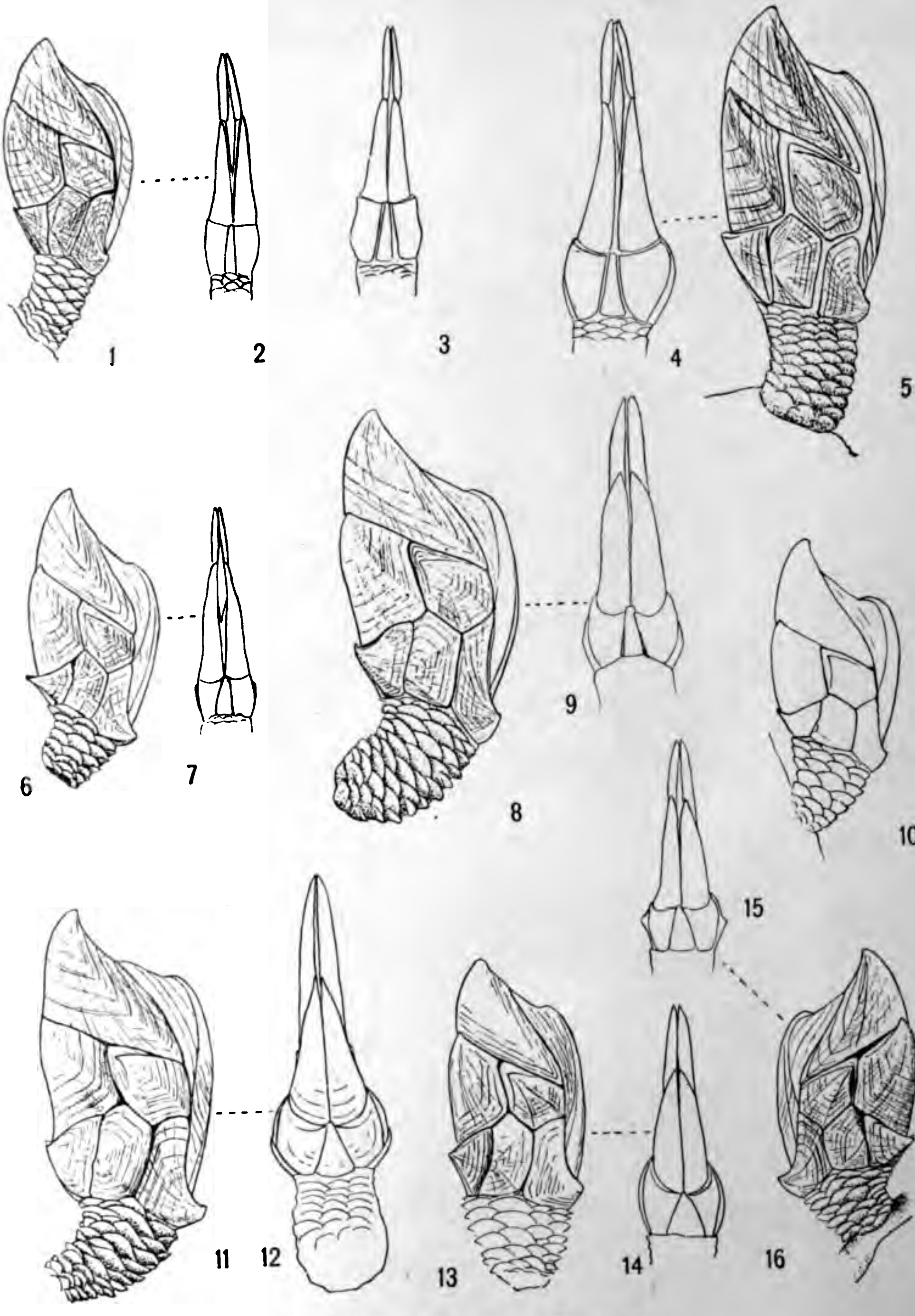
4–6. *Verruca hoeki*, new species. Carino-rostral, rostral, and tergo-scutal views of the type, ×10.

7–8. *Verruca nexa alba*, new subspecies. Top and carino-rostral views of the type.

INDEX.

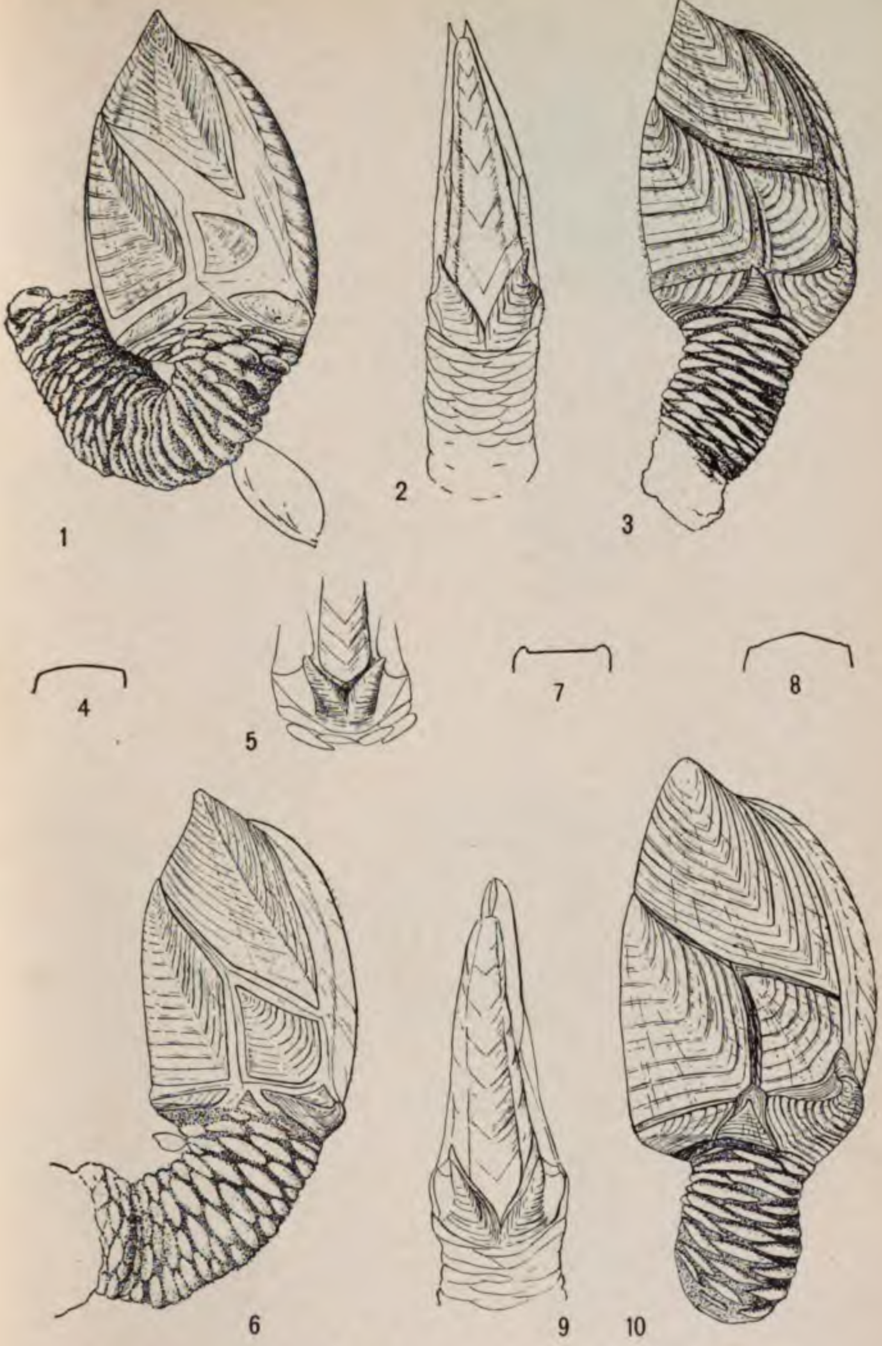
[Names of synonyms are in *italics*.]

O



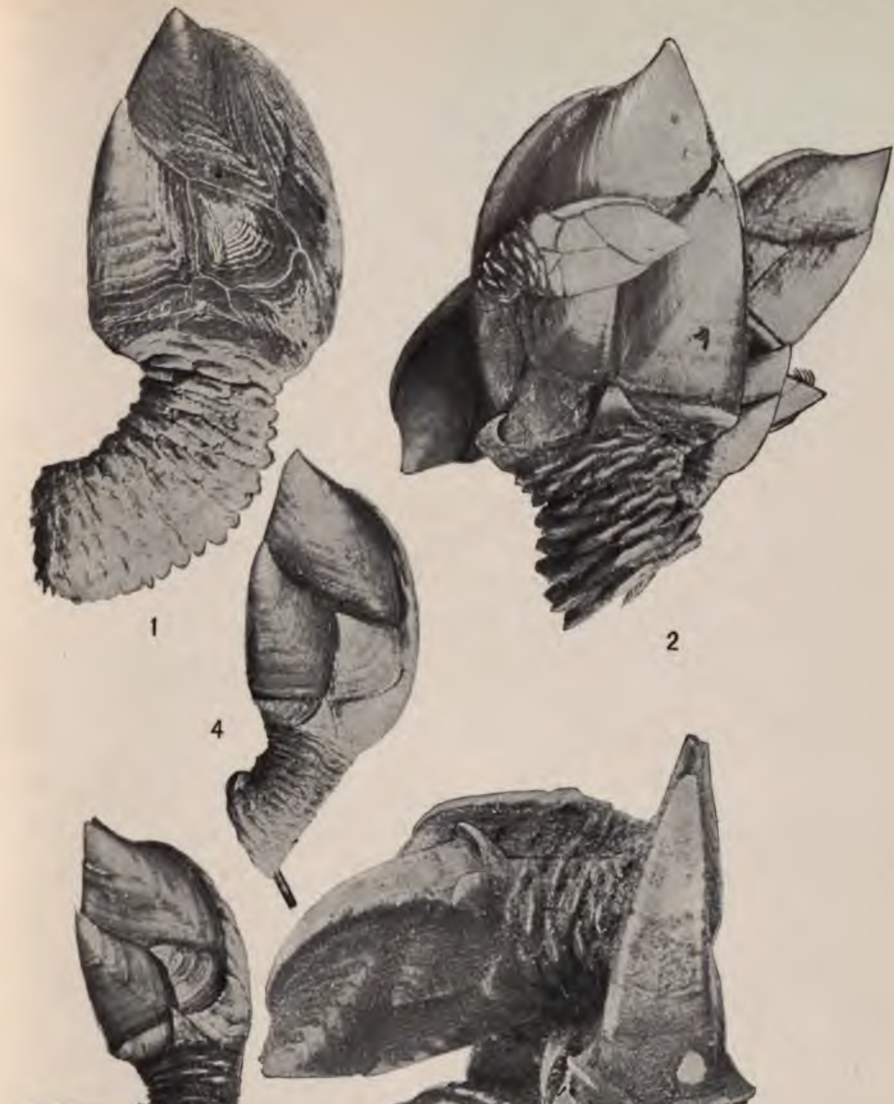
SCALPELLUM STROEMII AND ITS SUBSPECIES.

FOR EXPLANATION OF PLATE SEE PAGE 117.



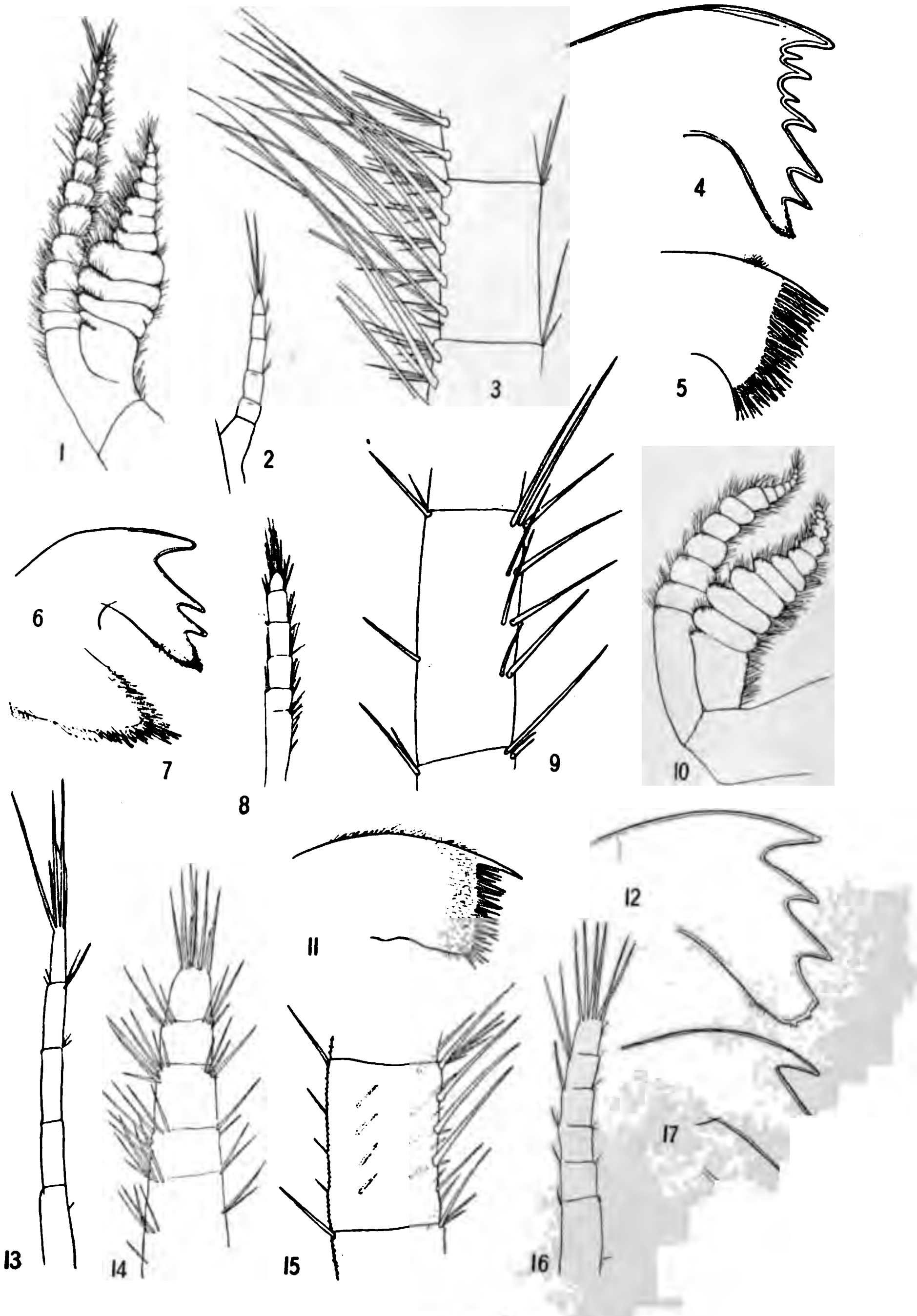
1, SCALPELLUM GIGANTEUM; 2, 3, 7, S. REGIUM LATIDORSUM; 4, 5, 6, S. REGINA; 8, S. REGIUM; 9, 10, S. REGIUM, VARIETY.

FOR EXPLANATION OF PLATE SEE PAGE 117



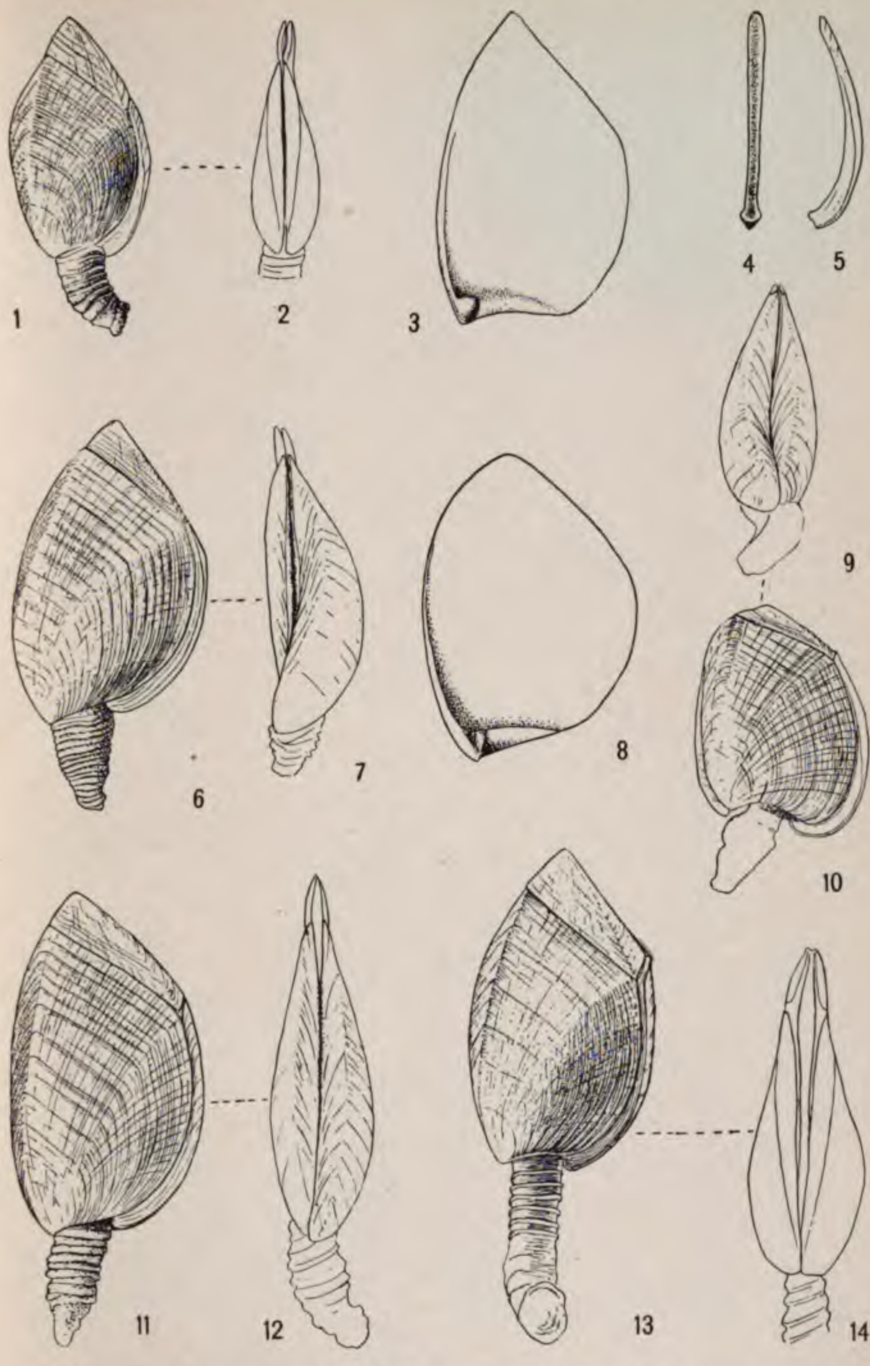
1, Scalpellum giganteum; 2, 3, S. velutinum; 4, 5, S. regium.

For explanation of plate see page 117.



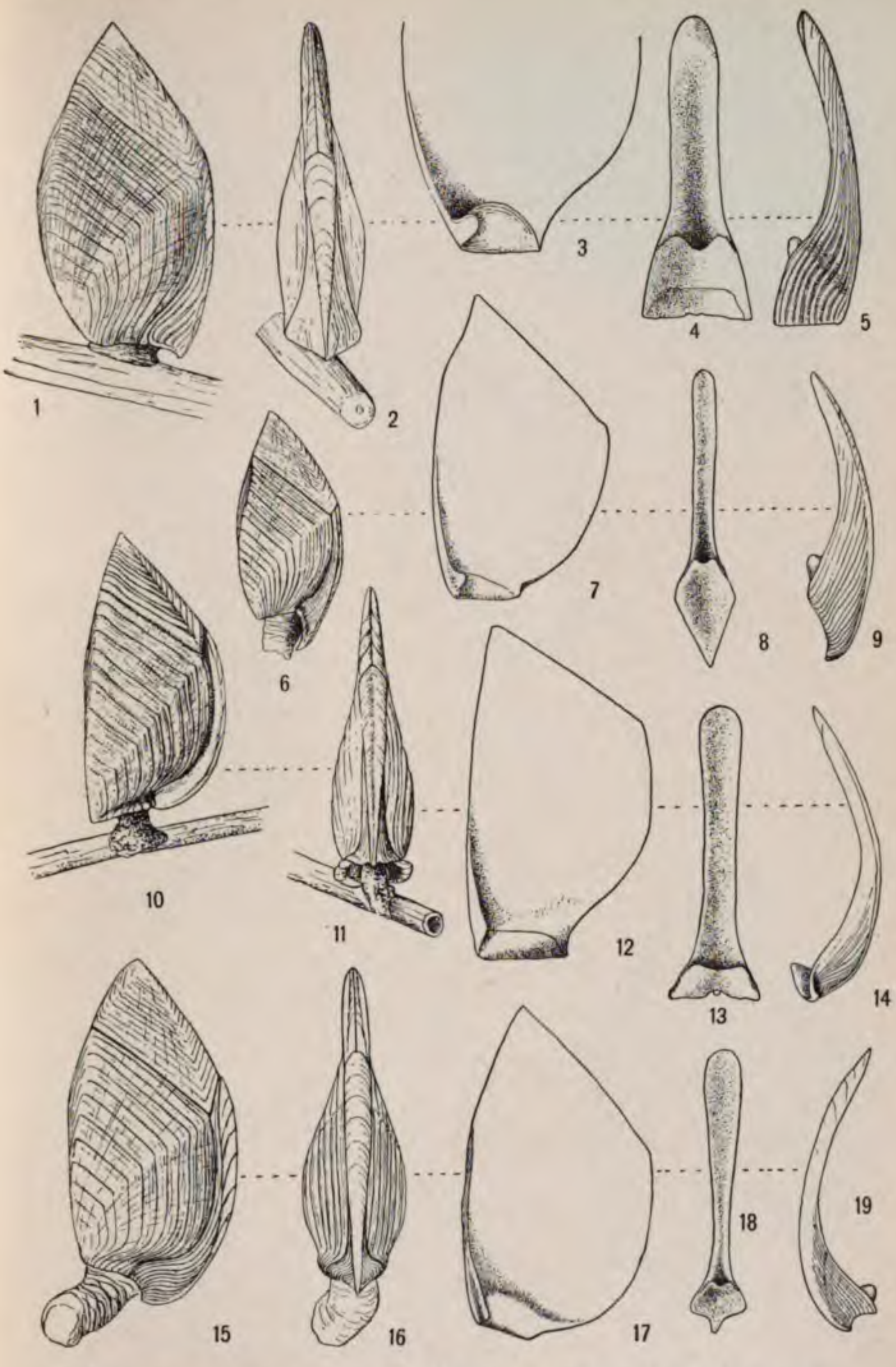
MANDIBLES, MAXILLÆ, AND CIRRI OF LEP[illegible]DÆ

FOR EXPLANATION OF PLATE SEE PAGE [illegible]



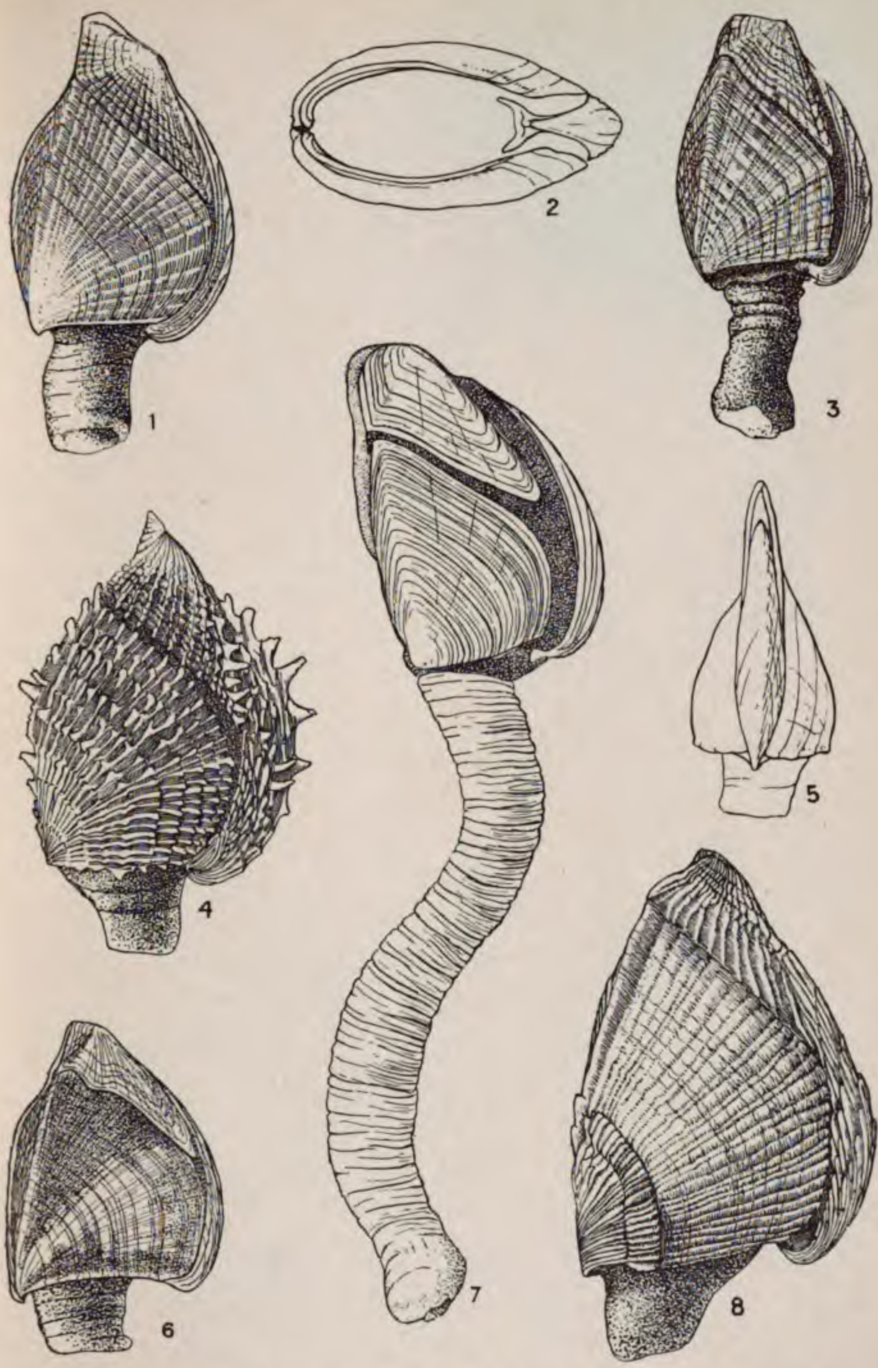
1, 2, Pœcilasma kæmpferi litum; 3-5, P. kæmpferi; 6-8, 11, 12, P. inæquilaterale; 9, 10, P. i. breve; 13, 14, P. k. novæangliæ.

For explanation of plate see page 118.



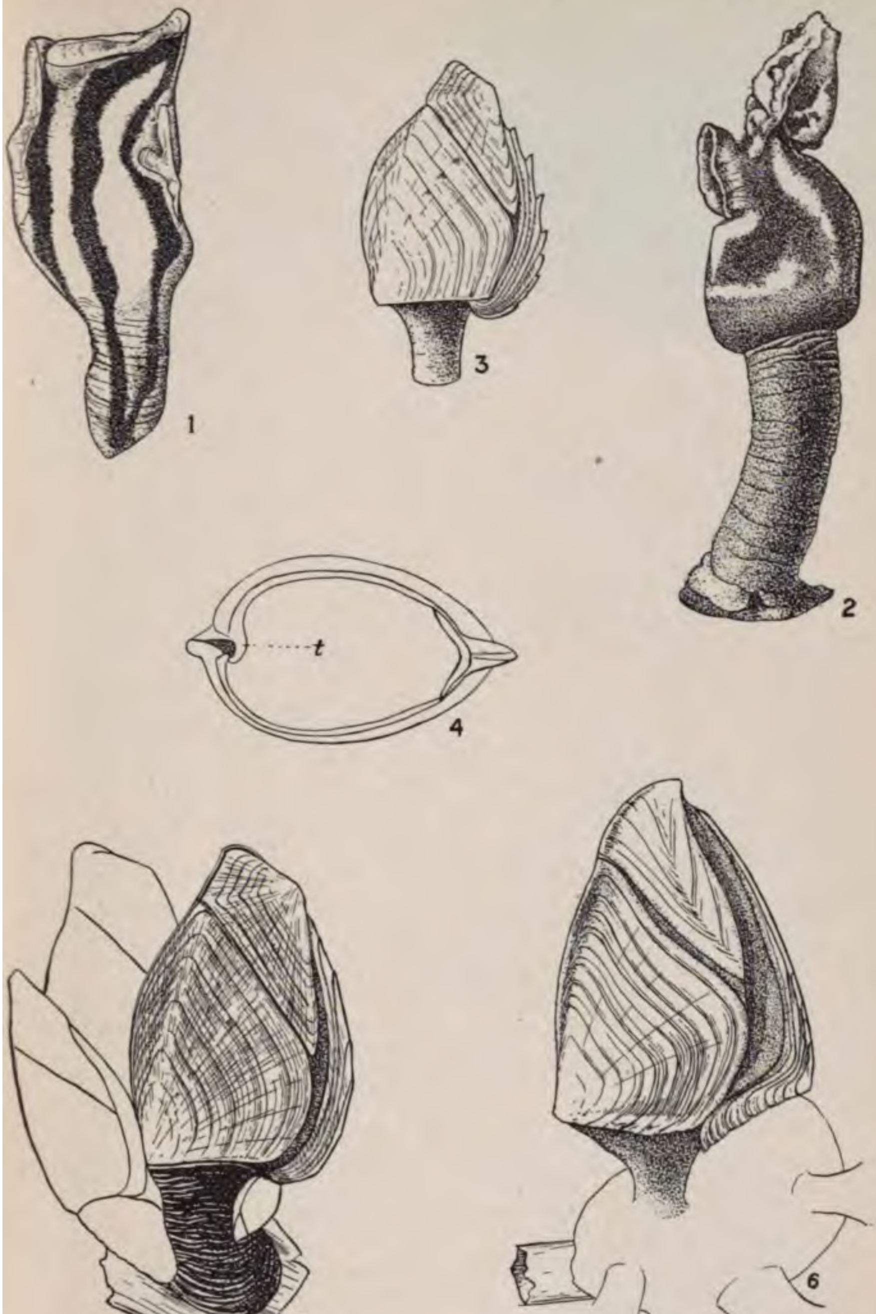
1-5, MEGALASMA SUBCARINATUM; 6-9, M. GRACILE GRACILIUS; 10-14, M. RECTUM; 15-19, M. ANNANDALEI.

FOR EXPLANATION OF PLATE SEE PAGE 118.



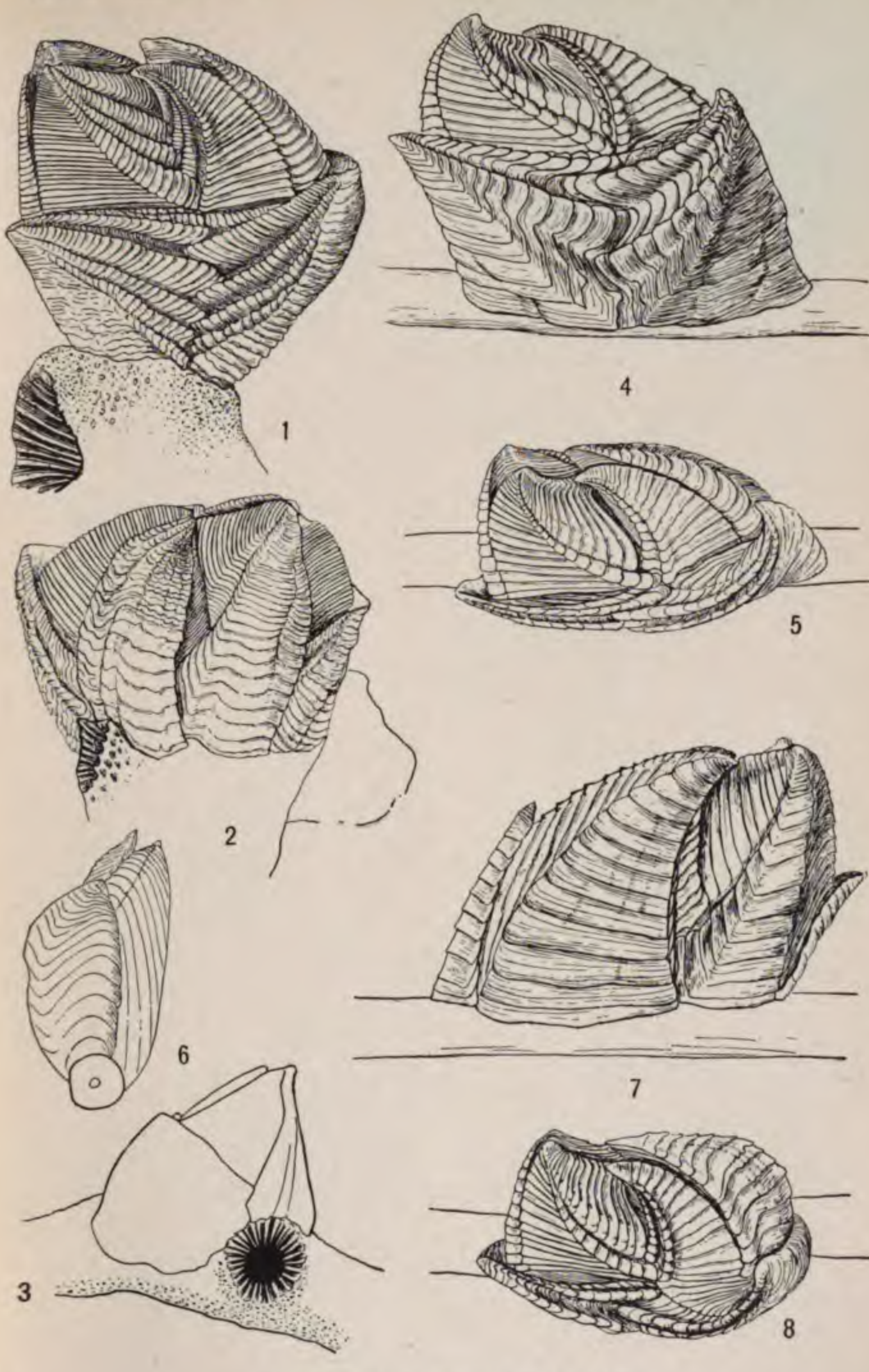
1, 3, LEPAS ANSERIFERA; 2, L. HILLII; 4, 5, 6, L. PECTINATA, VARIETIES; 7, L. HILLII; 8, L. PECTINATA.

FOR EXPLANATION OF PLATE SEE PAGE 118.



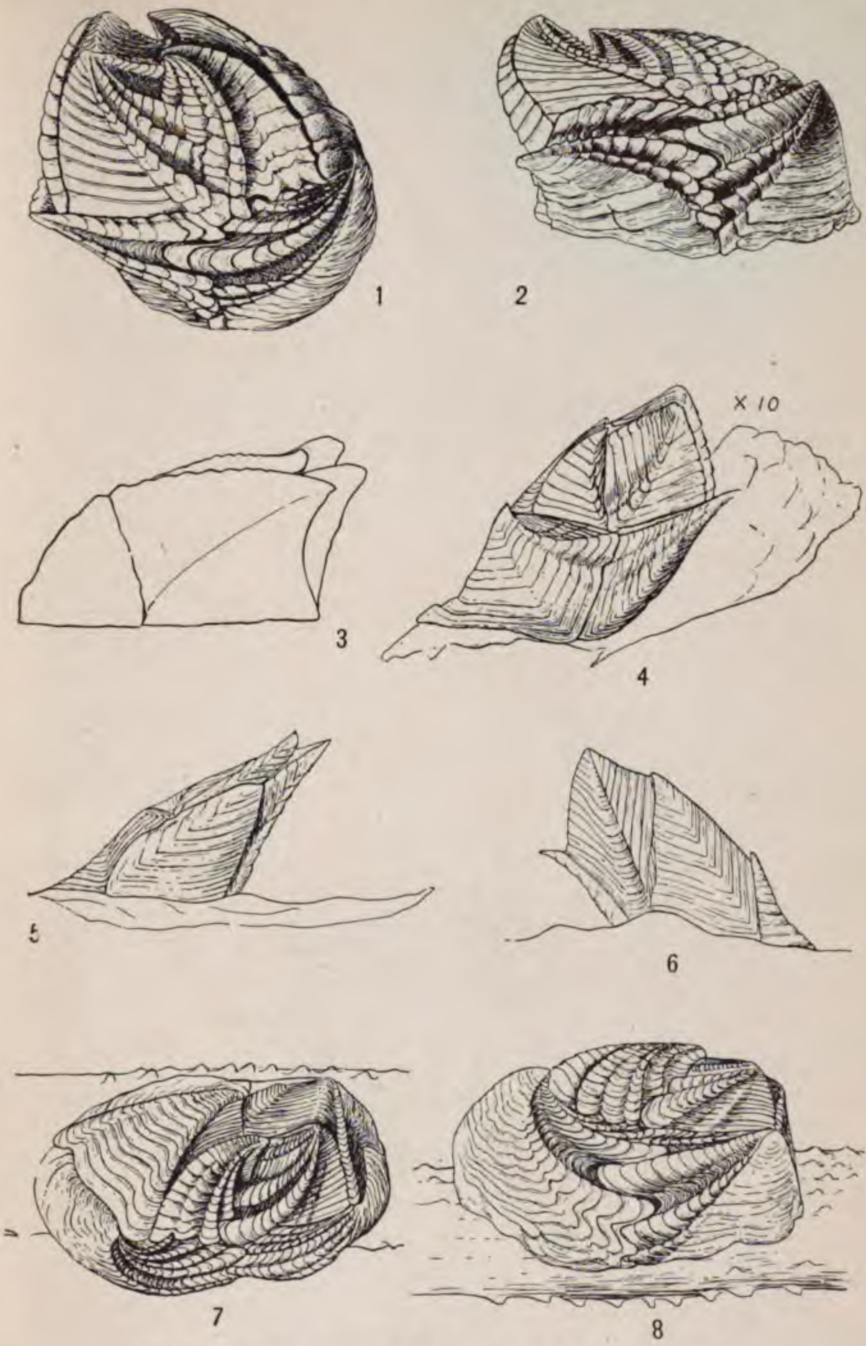
1, Conchoderma virgatum; 2, C. auritum; 3, 4, 5, Lepas anatifera; 6, L. fascicularis.

For explanation of plate see page 119.



1-3, VERRUCA EUGLYPTA; 4-8, V. DARWINI.

FOR EXPLANATION OF PLATE SEE PAGE 119.



1-3, VERRUCA CALOTHECA; 4-6, V. HOEKI; 7, 8, V. NEXA ALBA.

FOR EXPLANATION OF PLATE SEE PAGE 119.

SMITHSONIAN INSTITUTION
UNITED STATES NATIONAL MUSEUM
Bulletin 61

VARIATIONS AND GENETIC RELATIONSHIPS OF THE GARTER-SNAKES

BY

ALEXANDER G. RUTHVEN

Curator of the University Museum, University of Michigan, Ann Arbor

WASHINGTON
GOVERNMENT PRINTING OFFICE
1908

SMITHSONIAN INSTITUTION
UNITED STATES NATIONAL MUSEUM
Bulletin 61

VARIATIONS AND GENETIC RELATIONSHIPS OF THE GARTER-SNAKES

BY

ALEXANDER G. RUTHVEN
Curator of the University Museum, University of Michigan, Ann Arbor

FOR THE INCREASE AND DIFFUSION OF KNOWLEDGE AMONG

Published June 24, 1908.

ADVERTISEMENT.

The scientific publications of the National Museum consist of two series—the *Bulletin* and the *Proceedings*.

The *Bulletin*, publication of which was begun in 1875, is a series of more or less extensive works intended to illustrate the collections of the United States National Museum and, with the exception noted below, is issued separately. These bulletins are monographic in scope and are devoted principally to the discussion of large zoological and botanical groups, faunas and floras, bibliographies of eminent naturalists, reports of expeditions, etc. They are usually of octavo size, although a quarto form, known as the Special Bulletin, has been adopted in a few instances in which a larger page was deemed indispensable.

This work forms No. 61 of the Bulletin series.

Since 1902 the volumes of the series known as "Contributions from the National Herbarium," and containing papers relating to the botanical collections of the Museum, have been published as bulletins.

The *Proceedings*, the first volume of which was issued in 1878, are intended as a medium of publication of brief original papers based on the collections of the National Museum, and setting forth newly acquired facts in biology, anthropology, and geology derived therefrom, or containing descriptions of new forms and revisions of limited groups. A volume is issued annually, or oftener, for distribution to libraries and scientific establishments, and in view of the importance of the more prompt dissemination of new facts a limited edition of each paper is printed in pamphlet form in advance.

RICHARD RATHBUN,
Assistant Secretary, Smithsonian Institution,
in charge of the United States National Museum.

WASHINGTON, U. S. A., *June 15, 1908.*

TABLE OF CONTENTS.

LIST OF ILLUSTRATIONS.

THAMNOPHIS ORDINOIDES ELEGANS (TULE LAKE, OREGON).

VARIATIONS AND GENETIC RELATIONSHIPS OF THE GARTER-SNAKES.

By ALEXANDER G. RUTHVEN,
Curator of the University Museum, University of Michigan, Ann Arbor.

INTRODUCTION.

In these times, when there is so great activity in evolutionary research along all lines of biological work, it is important that systematic studies be directed so as to throw light on the problems involved in the origin of species. An examination of the actual sytematic work that has been done, however, can not fail to reveal the fact that only a comparatively small amount of it has been done with this end in view. This is especially true in the case of reptiles, and more particularly in the order Serpentes, where but little work has been contributed to this phase of the subject. Without doubt one reason for this is to be found in the fact that the snakes are a most perplexing group systematically, owing to the difficulty in finding characters that are capable of defining natural groups. For this reason but a comparatively small amount of work has been done on the group. As Baird said in 1853 (1853, p. v.), "Systematic workers all carefully avoid the subject of Ophidians, each waiting for the others to make the first step;" and although in the fifty years that have elapsed since this statement was made considerable work has been done upon the order, and a multitude of forms have been described as the result of the careful studies of Baird, Stejneger, Cope, Garman, Brown, Van Denburgh, and others, only a very few conclusions have been reached as to the origin and descent of the forms.

This barrenness of general results can not be entirely attributed to a lack of facts, but must be inherent, to some degree at least, in the methods employed. An examination of the systematic work that has been done upon the snakes shows, as might be expected, that it is largely analytical in its nature, being for the most part descriptive of the existing diversities. That this kind of work is of value can not be questioned, for, as has been well said by Tutt (1896, p. 6): "The species describer, if he does his work intelligently and carefully, is giving the evolutionist the exact material on which alone

any stable conclusions can be drawn with precision, and, if his work is thus valuable, we must still recognize, nay, welcome, those who give their best powers to the unraveling of the species in their multitudinous forms, since these form the basis of all advanced evolutionary study." While the value of the analytical method must, therefore, be admitted, its limitations should be clearly seen. Needless to say it is not a knowledge of the present conditions alone that is necessary, which is all that the application of this method can yield, but a knowledge of the processes that have brought them about, for systematic work can only become a true science when it seeks to formulate the laws involved in the history of the present forms.

The history of a particular form can not be worked out by determining its characters alone, but its affinities must be sought for, by determining its similarities with other forms, and the factors which influence it, before its derivation can be discovered. After analysis, therefore, as has been said, comes the need of a larger synthesis. This argument is often verbally granted by systematists, who, however, still adhere to the analytical method with the plea that a sufficient body of facts has not as yet been accumulated upon which to base general conclusions. This may probably be said of snakes with more truth than for many other groups, but, when it is noted that the work that has been done offers very little material upon which to base such general conclusions, it would seem that a few generalizations based upon such limited material as is now available might in many cases go far toward directing the course of future analytical work toward better results. In the words of Meldola (1896, p. 7), "However large the number of facts, and however cautious or conservative the worker may be, it is an established doctrine, taught by the whole history of science, that real progress begins when we go to seek for facts armed with at least the suggestion of a principle if not with a complete theory based on facts already accumulated by observation or experiment."

Furthermore, it seems to be evident that any comprehensive attempt to do synthetical systematic work must be made upon a geographic basis, for the interrelations between the organisms and their environments are such that the history of the present forms is involved with the history of the conditions with which they are associated, and affinities can only be sought in the light of geographic probability. As Adams (1902a, 356) puts it, "It should be apparent that in the past history of a region the conditions and highways must be taken into consideration if we wish to understand the origin and migrations of the diverse elements which enter into the fauna and flora of any given region." As a study of the interrelations between organisms and the natural environment, geographic distribution

attains to a wider significance than it has previously enjoyed. Hitherto, as the result of the application of analytical methods to taxonomy, it has been largely static in its nature, as it concerned itself principally with the determination of the present distribution of the forms as if this arrangement were fixed, thus affording only a description of the present conditions. In connection with the synthetic method, however, it is more comprehensive and essentially dynamic in its nature, for it not only takes note of the present distribution of the forms but at the same time recognizes the close relations that exist between this arrangement and the environment, and its consequent unstability, and by the determination of the laws of change furnishes a powerful aid to the interpretation of the past history of the present forms, without a knowledge of which it is impossible to explain the present conditions.

THE TAXONOMY OF THE GARTER-SNAKES.

PRESENT STATUS OF THE GENUS.

As an example of the confusion into which a group may be thrown by systematists who see in every association of traits a species, probably no better could be found than that of the common garter-snakes of North and Middle America, composing the genus *Thamnophis* Fitzinger. This genus has long stood in the minds of herpetologists as a synonym for chaos, and has been a source of trouble to those who attempted to compile local lists, for specimens may be found in almost any locality which can not be referred exactly to any described form, or doubtfully to two or three. The result has been that in the attempt to express these differences the method of analysis has been carried to the extreme, and something like sixty-five forms have been described.

This has not solved the problem, however, for, owing to the extent of variation and the fact that descriptions have been based on different combinations of traits without an adequate knowledge of the variations, it has been practically impossible to define accurately any of these forms. In nearly every species the characters often seemingly grade off in different directions independently of one another, and it has happened more than once that a diagnosis has been subsequently shifted from the form represented by the type-specimen to an entirely different one, by the author of the species himself. Anything approaching a natural key was not to be thought of, and a worker was fortunate if he could devise an artificial one that would sufficiently define the forms in particular regions so that they could be recognized. It is an instance where the insufficiencies of the methods applied have been thrown prominently into the foreground by the nature of the material,

for a widely ranging and variable group with all the diversities brought about by environmental and racial influences does not furnish the most favorable material for the application of purely analytical methods.

An examination of the most comprehensive work that has been done on the garter-snakes will show this. In his "Crocodilians, Lizards, and Snakes of North America" (1900), Cope has described the diversities in an exhaustive way, recognizing in all forty-six forms. Diversity is all that this work reveals, however, and a more minute splitting of the forms would only increase the complexity. Here one is shown the actual living varieties as they exist in North America to-day; the present conditions with all of their anomalies and apparent contradictions, with no key to possible relationships.[a] What is needed, it seems to me, is not more analysis but a greater knowledge of the affinities of the forms, so that the continuity of genetic relationships underlying the present diversities can be grasped.

METHODS EMPLOYED.

Three steps are necessary to determine the genetic relationships and simplify Cope's elaborate arrangement of the group: (1) The value of the characters must be determined; (2) the geographic probabilities must be utilized; (3) similarities and intergradations must be sought.

It may seem superfluous to insist upon the determination of the value of the characters used in systematic work on this group, for "good" characters, i. e., those which are constant within particular groups, are sought after by most systematists in forming their taxonomic groups, but in the sense in which it is here used this rule means more than this, in that it also requires the discovery of the significance of the variations.

In the work that has been done, as has been said previously, whenever a more or less stable combination of traits has been observed it has been described as a distinct form, and this with utter disregard as to how the distinctive characters may have been derived. For instance, *elegans* is separated from *radix* by the position of the lateral stripe, from *parietalis* by the smaller number of dorsal scale rows; *sirtalis* is separated from *radix* by the position of the lateral stripe and by a difference of two rows of dorsal scales, from *butleri* apparently only by the width of the lateral stripe. In these cases it has been sufficient to ascertain that these characters are little variable within the form, but what relations can be worked out from such facts until

---

[a] It is true that twenty-seven of the described forms are considered subspecies, and a diagram of affinities has been worked out, but the latter is mostly hypothetical, while most of the subspecies are either based merely upon individual variation or are erroneously arranged.

it is ascertained to what extent these characters are subject to modifications? Only when this is known can we hope to accomplish much in our attempt to discover the origin of the present forms.

This is very well illustrated in the synthetic taxonomic work that has been attempted. Several efforts have been made to combine the described forms into natural groups, and Stejneger, Brown, and Van Denburgh [a] have, in various papers, endeavored to establish the proper status of the different forms. The most comprehensive essay is that of Brown (1901) in his "Review of the Genera and Species of American Snakes North of Mexico," which appeared in 1901, and which may be considered as a reaction from the extreme position taken by Cope (1892) in his paper "A Critical Review of the Characters and Variations of the Snakes of North America." In this work Brown has attempted to unite the different forms into related groups, and, as will be shown later, has succeeded very well in some instances. But commendable as are his efforts, the methods employed, it seems to me, are unfortunate. For example, *sirtalis, leptocephalus* (*ordinoides*), *butleri, parietalis,* and *pickeringi* (*concinnus*) are united in one group on the basis of similarity in the scutellation without regard as to whether or not the characters included under this head are influenced by *definite variation,* and until this is determined there may be another explanation for similarity in scutellation than community of origin, namely, *parallel development.*

That there is convergence among the garter-snakes is illustrated by the fact that so high an authority as Boulenger (1893, 418) gave it as his opinion that the type of *brachystoma* (*butleri*) was a specimen of *leptocephalus* (*ordinoides*), incorrectly labeled as to locality. As Cope subsequently showed, there is no doubt as to the correctness of the locality, so that it is highly improbable that the two forms are directly related, and yet the parallelism is so close that if unlabeled as to locality it is often very difficult to distinguish between specimens of the two forms. (See also p. 188.) It is essential, therefore, to determine first of all along what lines the present combinations of characters may have developed, in order that there may be no confusion by parallelism.

Another prime objection to the synthetic work that has been attempted is that the *geographic probabilities* have been so largely disregarded. A knowledge of the extent of the variation in any form affords little evidence of affinities if the geographic trends are ignored

[a] Garman's arrangement (1883) is in many respects the most comprehensive, as he considers the group in detail. There is, however, so little basis given for the grouping which he has adopted, and so many manifest errors, that his synopsis must be considered rather as an effort to reduce the number of species than as a rational attempt to establish natural affinities.

as they always have been in this genus. And again while the law that the direct relative of any form will generally be found in a neighboring environment (see p. 192) may not be universal among the vertebrates the evidence at the present time shows that it is valid in a great number of cases, so that one must be very cautious of this point in grouping the forms of any group.

Cope in his general work recognized five varieties of *sirtalis* east of the Mississippi River, and yet the range of these forms could not be defined relative to each other, as they were reported from various parts of the same region and in association with numerous other varieties of the same stock, in utter defiance of the above law, but as most of these forms were based on slight variations and have been mostly dropped, they do not merit detailed discussion. The affinities that have been claimed for recognizedly distinct forms, however, is open to the same criticism. For example, if *ordinoides* and *concinnus* are both derived from *parietalis*, one must invoke the aid of some form of physiological isolation to account for their present distinctness, for they occupy the same region and environment, and *concinnus* is not considered far enough separated from the parent stock to be classed as a distinct species. Similarly also the derivation of *radix* from *sirtalis* is different from what one might expect from their geographic location, for *radix* lies entirely within the range of *sirtalis* and *parietalis*. Thus geographic probability must also be observed in tracing genetic lines if we would avoid the grouping of forms of diverse origin, which by their similarity might reasonably be adjudged to be related.

Having determined the significance of the variations, and by observing the geographic probabilities, considerable advance may be made toward determining genetic relationships, and it only remains to look for similarities and intergradations. For example, we may thus have determined that the smaller scutellation of *ordinoides* may have been derived by dwarfing from some other form with a larger number of scales, and that it is possible, geographically, that it may have been derived from the snakes of southern California or from those in the Great Basin. It is not enough to say that the present combination of traits which we call *ordinoides* is constant, but we must cast about for similarities with neighboring forms in order to determine its origin if we are to avoid the multitudinous varieties of systematists whose vision is blurred by the present divergences. The species-describer searches for pure types which are found only away from the geographical meeting places, but if we wish to discover relationships we must not avoid the boundary lines, but seek them. If we search for similarities in the light of the influence of modifying factors on the characters, and with an eye to geographic probabilities, we should be able to see back of the present diversities, grasp the natural affinities, and come in touch with the questions of origin and descent. It was

in the belief that the application of these methods to the group of garter-snakes would lead to such results, and thus greatly simplify our present knowledge, that this work was undertaken.

MATERIAL EXAMINED.

The conclusions reached in this paper are based upon a detailed examination of about three thousand specimens gathered from nearly every part of the known range of the genus,[a] so that I believe my knowledge of the variations is well founded so far as it goes. It must be acknowledged, however, that much remains to be done, for, owing to the fact that it has been found impossible to obtain extensive series from many localities, that entire forms are at present known from but few specimens, while in the case of some well-known forms specimens are unavailable from critical localities, it is impossible, in some instances, to do more at present than point out the probable relations, leaving them to be substantiated by detailed work when specimens shall be available.

One objection to the material that has been used is that it has been largely alcoholic, and it must be admitted that, as some of it has been in preservation for fifty years, it has not always been all that could be desired. This has been more of a limitation to the work, however, than a source of error, for the principal characters employed in the systematic work (scutellation, position of stripes, and tail length) can not become greatly modified in this way, and, although the color may become very much faded, the color pattern may in most cases still be made out.

A far more important objection to the material is that many of the specimens have but general locality labels, and throughout the present work it has been continually impressed upon the writer that *too much attention can not be paid by collectors to the securing of detailed locality and habitat data.* Specimens that are not labeled accurately, at least as to locality, are almost valueless in this work, while if habitat data were only available in each case much light would be thrown upon the explanation of the present distribution.

ACKNOWLEDGMENTS.

In the prosecution of the research upon which this paper is based I have become indebted to a number of persons without whose aid little could have been accomplished.

I wish first of all to acknowledge my indebtedness to Mr. Charles C. Adams, under whose direction the work has been carried on, for his

[a] The specimens examined represent every described form, with the exception of the *Eutaenia praeocularis* Bocourt (Le Natur, 1892, p. 278), from Belize, British Honduras. I am not certain of the identity of this form.

continued interest in its progress, and for many helpful suggestions and criticisms, particularly upon the general method of approach.

I am also greatly indebted to Dr. Leonhard Stejneger for the privilege of studying the material in the United States National Museum; to Mr. A. E. Brown for the opportunity of examining the specimens in the Academy of Natural Sciences of Philadelphia, and to Messrs. Whitmer Stone and James A. G. Rehn for assistance in doing so.

I am particularly indebted to the Field Museum of Natural History in Chicago, through Dr. S. E. Meek, for the loan of their excellent series of specimens, which has furnished the solution for several knotty problems that otherwise must have remained obscure. For the loan of the material in the American Museum of Natural History I am indebted to the Director, Dr. H. C. Bumpus.

My thanks are also due to Dr. Raymond Pearl, Agricultural Experiment Station, Orono, Maine, who suggested the method employed in plotting the variations in scutellation in the different forms. Most students of systematic zoology avoid statistical methods, which is unfortunate, as a graphic description is always much clearer than a written one. Simple diagrams, similar to the ones used in this paper, are easy to prepare, and summarize in the clearest and most concise manner the geographic variations in a form, and should be employed whenever possible. It may be well to say here that in these diagrams × denotes the arithmetical mean, the heavy lines the range of variations, O the mid-point of the range (the average of the two extreme individuals), and the numerals in the diagram the number of specimens; also that the stars on the maps do not represent the exact locality from which specimens have been examined.

I am also under obligations to many persons for aid in securing living specimens from localities from which records were desirable.

GENUS THAMNOPHIS.

DESCRIPTION.

Scutellation.—The genus *Thamnophis* of Fitzinger (1843, 26), established upon the *Coluber saurita* of Linnæus (1766, 385), and later defined as *Eutaenia* by Baird and Girard (1853, 24), belongs to the family *Natricidae*, and differs from its nearest American relative, *Natrix*, by the absence of scale pits and the presence of an undivided anal plate.

The cephalic plates are normal, consisting of paired internasals, prefrontals, occipitals, and parietals, and a single frontal. A loreal plate is present; the rostral normal in form and the nasals divided, the nostril being between them. There is usually a single preocular on either side, but in three forms (*elegans*, *ordinoides*, and *hammondi*)

there are frequently two, in two others (*angustirostris* and *melanogaster*) mostly two, and in one (*angustirostris*) frequently three.

The postoculars are most often three in number, occasionally varying individually to two or four, in one form (*melanogaster*) being very frequently two. The temporal plates are ordinarily one followed by two or three, but in one form (*butleri*) there is frequently but a single plate in the second row; occasionally the first temporal is divided, and frequently there are four scales in the second row, but these are individual variations. The supralabials are 6, 7, 8, or 9 on either side, the eye resting upon the third and fourth, or fourth and fifth, except in *angustirostris* in which the lower postocular is prolonged forward beneath the eye to separate the orbit from all but one supralabial.

There is a triangular mental plate at the symphysis of the lower jaw, and posteriorly from this the infralabial plates, 8, 9, 10, or 11 (very rarely 12) in number, extend to the posterior angle of the mouth, being separated, except the first pair, which are prolonged inwardly to meet on a median line, by two pair of chin shields. The anterior pair of chin shields is usually the shorter, but in two forms (*ordinoides* and *elegans*) they are quite constantly equal or longer than the posterior pair.

The maxillary teeth are apparently as in the other forms in the family, i. e., rather abruptly longer near the posterior end of the maxillary bone than anteriorly. The genus *Atomarchus* Cope (*Stypocemus*, *Chilopoma*) was based on forms in which the maxillary teeth were equal throughout (*melanogaster* and *angustirostris*), but, as later stated by Cope, the excess in the length of the posterior teeth is so small in many specimens of other species that it is impossible to distinguish them from apparently isodont specimens of these forms, while we have, moreover, seen specimens of *melanogaster* in which the posterior teeth were nearly, if not quite, as elongated as in any form in the genus.

On the body there are 17 to 23 longitudinal rows of dorsal scales; these being normally arranged in an even number of rows on either side of a median dorsal series. The scales are all keeled with the exception of those of the first row, which are usually smooth or but weakly keeled; in one instance (*melanogaster*) those of the second row also tend to become smooth, the keels being generally weaker than those of the rows above.

The abdominal plates consist of a single series of large transverse scutes that vary in number both individually and racially, the extremes for the genus being about 132 to 180 from chin to anus. The anal plate is almost invariably entire, while the subcaudal plates, which like the abdominal plates are also variable in num-

ber, consist of a double series of scutes about 49 to 134 in number from the vent to the tip of the tail.

Color.—The color pattern may be described in general as three light stripes upon a darker ground, and, although there is considerable detail and variation in color, this description will be found to hold in a general way for the genus.

The ground color on the scales above the lateral stripe varies, as a rule, from dark yellow at one extreme through the olives to black at the other, and usually, when light enough to show it, exhibits longitudinal rows of black spots. Where best developed (*radix*) these spots are arranged in three longitudinal series on either side, one below the lateral stripe and two above, the individual spots of each series alternating with those of the adjacent rows. The arrangement is not always so regular, however, for from this ideal condition, so to speak, variations occur in various directions. In the greater number of instances the spots of the first row are broken up and do not form a definite series, while in many cases also the spots of the second and third rows are interrupted by the ground color along the keels of the scales. Frequently the spots of all three rows tend to fuse with those of adjacent rows and form transverse bars or blotches, and in one form (*scalaris*) this is the pattern throughout the length of the body. Occasionally the spots retreat from the scales, becoming reduced to narrow broken lines along the stripes, and in one group (*Sauritus*) this is the characteristic pattern. In other forms the scales between the spots are occasionally red. In all of the forms exhibiting one of these styles of coloration the spots may be entirely obscured by the darkening of the ground color, which in some forms seems to be the typical condition.

When the skin is stretched the scales are drawn apart, and it is seen that the lateral spots on the scales represent corresponding series on the skin. Those beneath the first row are difficult to observe, as the skin is here apparently less distensible; they are evidently, however, like their representatives on the first row of scales in that they are more subject to irregularities, and are seldom to be made out as a definite series. Above the lateral stripe the second and third rows are usually distinct on the skin, whether or not the spots on the scales are broken up or obscured by the ground color. They also show a tendency to fuse, however, and this fusion may either take place by the general fusion of the spots, leaving only scattered light patches to indicate the interspaces; by transverse fusion into bars; by the fusion of the upper row, which may involve also part or all of the second row, the interspaces being limited to the vicinity of the lateral stripe; or more rarely the two series fuse as two longitudinal bands.

When the spots on the skin are generally fused, those on the scales are either wanting or represented in narrow broken bands along the stripes, as mentioned above. When, however, the latter show a tendency to form cross-bars, the spots on the skin exhibit the same arrangement. Practically always, however, the first spot of the two rows above the lateral stripe fuses with its neighbor to form a large nuchal blotch, which may or may not be distinct on the scales. These blotches may cross the lateral stripe and fuse with the corresponding spot on the first row of scales, and in one section of the genus (the *Sirtalis* group) are frequently followed by one to five similar blotches which are likewise formed by the fusion of the spots of the second and third rows. The color of the skin in the interspaces is usually white or very light bluish or greenish, but it may also be yellowish or red, and the color of the interspaces usually encroaches to a varying degree upon the involved scales.

The stripes are typically three in number, consisting of a dorsal which involves the median and usually a varying amount of the adjacent rows, and a lateral on either side situated on the second and third, third, third and fourth, or second, third, and fourth rows from the belly. The color of these stripes is usually brighter than the ground color, being white, various shades of blue, green, or yellow, or occasionally red. The laterals, while frequently narrow, usually involve two rows of scales. In one form (*butleri*) they cover part of three rows, while in another (*marcianus*) they are, for most of the length, on one only. In only two forms (*angustirostris, sumichrasti*) are they characteristically obsolete. The dorsal stripe, on the other hand, varies in width from one to five or six rows and is more often lacking. Neither the dorsal or laterals are absent individually except in melanistic specimens, being very constant in the forms which possess them.

The head is usually of the same color above as the ground color of the back, but it is often more olive or brownish, and is occasionally marked with red or black. There are nearly always two proximate bright spots upon the parietal plates, although these are occasionally absent in individuals irrespective of race. On the sides of the head the dark color of the upper surface meets the usually much lighter color of the superior labials, into which it grades on the preoculars, postoculars, and temporals. The labials are as a rule much lighter than above, the color being varying shades of green, yellow, blue, or occasionally white. They are nearly always more or less margined with darker, and there is a tendency, more pronounced in some forms than in others, for one of these dark margins to be extended upward along the anterior margin of the preoculars, and one along the posterior margin of the postoculars, making a conspicuous pattern on the sides of the head.

The ventral surface is ordinarily some shade of slate, often slightly iridescent, and frequently marked with red or black. The bases of the abdominal scutes nearly always possess a varying amount of black which is concealed by the overlying edge of the preceding scute. Where this pigment is well developed it forms a black bar along the base of each ventral scute, which is enlarged at either end into a spot that protrudes beyond the edge of the superincumbent scute, thus giving rise to the appearance of a row of spots along the sides of the belly. In some forms this bar is enlarged in the middle, and frequently to such an extent that it projects beyond the overlying scute and forms a median ventral band that varies in width from a narrow line to a broad band that covers most of the belly (*elegans*, *melanogaster*). The ground color of the belly blends with the color of the dorsal surface on the first row of scales.

RANGE.

The area inhabited by the genus *Thamnophis*, as at present known, includes all of North and Middle America north of the southern boundary of Guatemala and south of the fifty-second parallel of north latitude, although it is possible and even probable that both of these limits are surpassed. These snakes are known from almost every part of the intervening country except the lower part of the peninsula of Lower California[a] and the State of Sonora, Mexico, but the absence of records from both of these localities is probably due to the fact that these regions have been but little explored. The distribution of the different forms will be considered in detail when these are taken up.

HABITS AND HABITAT RELATIONS.

As in the case of most reptiles, very little is known of the habitat relations of the garter-snakes. Where detailed notes are available they will be given in the discussion of the different forms. In general it may be said that while the snakes of this group are not aquatic they apparently prefer the vicinity of water, as they occur in such places much more abundantly than elsewhere, although they are found not uncommonly on higher ground and in dryer situations. The extent to which they prefer damp situations also varies somewhat with the form and the region, as will be shown later.

Their food is in conformity with the nature of their habitat, and varies accordingly. Thus, individuals in the vicinity of water apparently subsist largely on frogs, tadpoles, and fish, while on the dryer uplands they have been observed to eat insects, earthworms, toads,

[a] A single specimen has been recorded from Cape San Lucas, Lower California, but there is good reason to believe that there is an error in this record. (See p. 161.)

small mammals, and fledgling birds. While in captivity it seems to be impossible to get them voluntarily to eat dead food, but in the wild state specimens of three species (*sirtalis*, *radix*, *elegans*) have been observed to take frogs, small mammals, and birds that had been dead for a considerable time.

In the northern part of their range, where cold winters prevail, they hibernate like other reptiles, usually passing the months of December, January, February, and part of March in a dormant condition. The actual time of hibernation is dependent upon the character of the weather, for a few warm days in January or February is sufficient to bring them out. This was well illustrated in the winter of 1906, which was an exceptionally mild one, and garter-snakes were recorded in southern Michigan (Washtenaw County) on January 22. At the approach of warm weather in the spring the garter-snakes are among the first snakes to appear, and may soon be found in numbers in the vicinity of marshes, ponds, and streams, feeding voraciously upon frogs that are so abundant in such places at this time of the year.

But little is known regarding the time of coition, but at least one of the forms (*sirtalis*) is known to copulate in the spring, bringing forth its young in July, August, and September, and, as the other forms for which we have data also bear their broods at this time, the supposition seems justifiable that copulation in most cases takes place in the spring, notwithstanding the statement of Coues (1878, 278) that specimens of *radix* have been observed *in coitu* in September and October. In some instances, at least, they exhibit a gregarious tendency during the breeding season. In 1880, E. L. Ellicott (1880, 206–207) reported having seen an aggregation, in the following words: "I personally had the pleasure of observing it twice, both times very early in the spring, and in localities which could be called wilderness. I first saw such a bundle of snakes in the neighborhood of Ilchester, Howard County, Maryland, on the stony bank of the Patapsco River, heaped together on a rock and between big stones. It was a very warm and sunny location, where a human being would scarcely disturb them. I reasoned that the warmth and silence of that secluded place brought them together. Some hundreds of them could be counted, and all of them I found in a very lively state of humor, hissing at me with threatening glances, with combined forces and with such persistency that stones thrown upon them could not stop them nor alter the position of a single animal. They would make the proper movements and the stone would roll off; all the snakes in this lump were common snakes (*Eutaenia sirtalis* L.)." As Hay (1892 b, 528) remarks, "It is altogether probable that such assemblages are determined partly by the sexual impulses," a view that is confirmed by the fact that in the spring groups do apparently

tend to be formed under the incitement of the sexual stimulus. Indeed Ellicott goes on to say, "The second time I noticed a ball of black snakes rolling slowly down a steep and stony hillside on the bank of the same river, but about 2 miles above Union Factory, Baltimore County, Maryland. Some of the snakes were of considerable length and thickness, and, as I noticed clearly, *kept together by procreative impulses.*" (The italics are mine.)

The young are born alive, the usual number in each brood varying with the age of the snake, in the different forms and possibly in different parts of the range of the same form. (See p. 191.) Dr. J. Schneck (1882, 1008) records a brood of 78 in *sirtalis*, and I have seen as few as four in *butleri*. I have had opportunity of witnessing the birth of hundreds of young garter-snakes of several different species, and as the method was exactly the same in each case observed, there is little doubt but that it varies little throughout the genus. Just before parturition the female stretches out more or less, and may or may not crawl slowly about, but in either case maintains her tail curved slightly upward at the base, thus expanding the anal opening. Distinct labor periods occur, during which the young emerge singly, although a varying number may be extruded in a single labor. In the majority of instances each young is still tightly coiled and invested in the fetal membrane when it appears, exactly as it has laid in the oviduct, although, owing to the occasional bursting of the sac during parturition, they sometimes *appear* to crawl from the anus. After birth the young snake lies quietly for a few seconds and then struggles lustily to thrust its head through the sac. If it is not successful it smothers (which occasionally occurs), but if it succeeds in breaking the sac it yawns once or twice, thrusts out its tongue, and crawls off, becoming at once very lively. As soon as the body becomes dry, the skin is shed, exuviation often beginning within fifteen minutes after the young snake has been ushered into the world.

The young snakes are apparently independent nearly from the first, probably, as Hay (1892 a, 389) has pointed out, owing to the fact that the yolk body is largely consumed before birth. I have never noticed in the case of those born in captivity (*parietalis, sirtalis, butleri, radix, sackeni*) a definite tendency in the young to remain near the mother for a time after birth, as has often been described. They almost immediately crawl away, hiding under sticks, stones, leaves, or other objects. Thus the occasional observations that have been recorded of a mother and her brood in the wild state were probably made immediately after the birth of the latter.

After birth the young snakes are for some time very secretive, and show usually a very decided tendency to conceal themselves under objects, and even to burrow in loose dirt, when in confinement. This is without doubt the reason why specimens of about this age are so

rarely captured. As Abbott (1890, 296–297) says of these and some other snakes, "It is not a little curious that considering the large numbers of eggs that are found in the earlier part of summer so few small snakes are to be seen. I have never come across one less than 4 inches in length, except in the cases of the hog-nose snakes, mentioned above, and of those which I have ushered into day by unceremoniously breaking the egg before the occupants were quite ready to emerge. Even larger snakes, those measuring 6 to 10 inches in length, are by no means common." Abbott is inclined to attribute this rarity of young snakes to enemies, but I believe it to be due, in large part at least, in the garter-snakes, to the retiring habits exhibited by the young snakes during this period of their life. In the case of those observed in captivity this secretiveness lasted until the first winter, and it is probably not until the following spring, at least, that they begin to seek their food in the open. In disposition the garter-snakes vary from the retiring, agile ribbon snakes to the more stocky aggressive species, such as *sirtalis* and *radix*. As a group, however, the adults are not retiring, a feature that combined with their abundance makes them the most common and widely known group of snakes in America.

VARIATION.

I have asserted that the first step in the search for relationships is to determine the variability of the characters. The traits that have been used in systematic work on the garter-snakes are the number of rows of dorsal scales, labial, ventral, and subcaudal scutes, the position of the stripes, comparative length of the chin shields, and proportionate length of the tail. It is now my purpose to subject each of these traits to an examination to determine whether or not they are variable, and, if so, the nature and extent of the modifications or variations.

In investigating the variations it is essential that a distinction be made at the beginning between individual, sexual, and geographic variation, for it is evident that until such a distinction is made we can not hope to determine the value of the traits in pointing out affinities. In systematic mammalogy and ornithology these distinctions are made, but unfortunately in snakes they have been largely ignored. For example, *radix* is generally described as possessing usually 7, but occasionally 8, supralabial scutes. Now it is conceivable that if no distinctions are made that the males might be characterized by 7 and the females by 8, or the opposite, that the variation is purely an individual one, or that there is an increase or decrease in the number in certain parts of the range, and until the actual conditions are ascertained there is little hope of determining affinities, for if in this particular form the variation is individual the

perpetual danger is encountered of correlating it with another in which the labials may also be said to be 7, occasionally 8, but in which this variation is geographic. As another example of this the usual formula given of the ventral scutes of different forms usually includes the extreme variation in number known in the group. It may be easily seen that this also offers no clue to affinities, for any geographic variation in the average that may exist and might serve to connect different forms is in this way completely obscured.

The nature of the variations may be determined of course by taking the mean of the variation for the different sexes in different localities throughout the range, it being necessary to distinguish between the sexes, for if there is considerable sexual variation the predominance of either in the series from particular localities may obscure any geographic differences that may be present. This requires a large series of specimens from each locality, however, which we regret to say have rarely been available in this investigation. However, notwithstanding the fact that sufficient material has not been available in some instances to establish the actual extent of the range of variation of the sexes in the different localities, we believe that the data obtained is in nearly every case sufficient to indicate the nature and trend of the modifications exhibited by the different groups.

Variation in scutellation.—It is not surprising to find that it is largely upon the basis of the scutellation that most of the forms of *Thamnophis* have been defined, for the number of scale rows, labial, ventral, and subcaudal scutes have long been regarded by herpetologists as available specific characters. Indeed, as will be brought out in the following discussion, these traits are, within limits, sufficiently stable to admit of their employment as diagnostic characters in the different forms of garter-snakes. Inasmuch, however, as similarity in the number of scales has been held to indicate genetic relationships, it is necessary to investigate the variations which they exhibit.

The number of rows of dorsal scales has undoubtedly been considered the most important systematic character in the determination of the different forms of this genus, as well as in many other groups of snakes. When an individual snake is examined these rows are found to be arranged in longitudinal series, running the entire length of the body, from the head to the tip of the tail. The scales of the different rows are alternately arranged, so that transverse as well as longitudinal series are formed.

Variation in number of dorsal scale rows.—The number of longitudinal scale rows on the body, i. e., anterior to the vent, is normally an odd number, as the series are usually paired on either side of a median dorsal row. If a specimen of some species (*sirtalis*, for example) be examined, it will be found that on the anterior half of the

body there are 19 rows of scales. If these rows be traced backward somewhat beyond the middle of the body, however, it will be noticed that a row is dropped on either side at approximately the same place, leaving 17. The decrease posteriorly in the number of scale rows, thus described for *sirtalis*, occurs in all of the garter-snakes, and the number usually given in diagnoses as typical of the different forms (23, 21, 19, or 17) is in every case the maximum number of rows, which, as we have just indicated, always occurs on the anterior half of the body. Furthermore, an examination of large series of these snakes has established beyond question *that the decrease in the number of scale rows posteriorly is brought about in all of the forms of garter-snakes by the loss of certain definite rows.* On all of the specimens examined with a maximum number of 23 scale rows anteriorly (*megalops*), which is the largest number that occurs in the genus, the fifth is first discontinued posteriorly, leaving 21, and shortly afterwards the sixth (now the fifth) leaving 19, and finally the fourth, leaving 17. In the specimens with 21 rows (*elegans*, *radix*, and *hammondi*, for example) it is the fifth row that is dropped first to leave 19, and then the fourth to leave 17. In those with 19 rows (*sirtalis*, *eques*, *sauritus*, etc.) the fourth is dropped posteriorly to leave 17, while when the maximum number of rows tends to be less than 19 (*butleri*, *ordinoides*, and *scalaris*) the fourth row drops out first to leave 17 and then the fifth (now the fourth) to leave 15.

It will be seen at once *that the order in which the rows are lost posteriorly in the different forms is the same as in the form having the maximum number of rows for the genus.* In fig. 1 a diagram has been constructed to show this law of reduction as it would be represented on a snake having a maximum number of 23 rows anteriorly and a minimum of 15 posteriorly—the extreme range of variation in the genus. An examination of this diagram shows that although the order in which the rows are lost is, when counted from the ventral series each time, as is usually done, 5, 5, 4, 4, the real sequence when expressed in terms of the maximum number of rows for the genus is 5, 6, 4, 7. The diagram also illustrates the manner in which the rows are lost, for in the great majority of cases the scales of the row which is dropped become smaller and finally cease, the adjacent rows converging to occupy the space. At the point where the row is discontinued there is often, however, a rather large scale bearing two keels, indicating that the last scale of the lost row has fused with its neighbor. In case such a fusion occurs it may be either with the row above or below, but the fact that the scales of the row to be dropped usually become smaller toward the termination of the series, and that the keel of this row is usually only on the edge of the large scale, generally denotes clearly which row is really lost.

The decrease in the number of scale rows posteriorly is, we believe, correlated with the taper of the body, for as the scales themselves decrease but little in size toward the tail the loss of the rows is a necessary result of the shortening of the metameres. Furthermore, as shown above, the reduction posteriorly takes place caudad to the middle of the body, i. e., where the body tapers to the tail. This phenomenon may not in itself be considered important, but, as will be shown directly, it has a wider significance than as an explanation of the manner in which the scutellation accommodates itself to the posterior diminution in the size of the body.

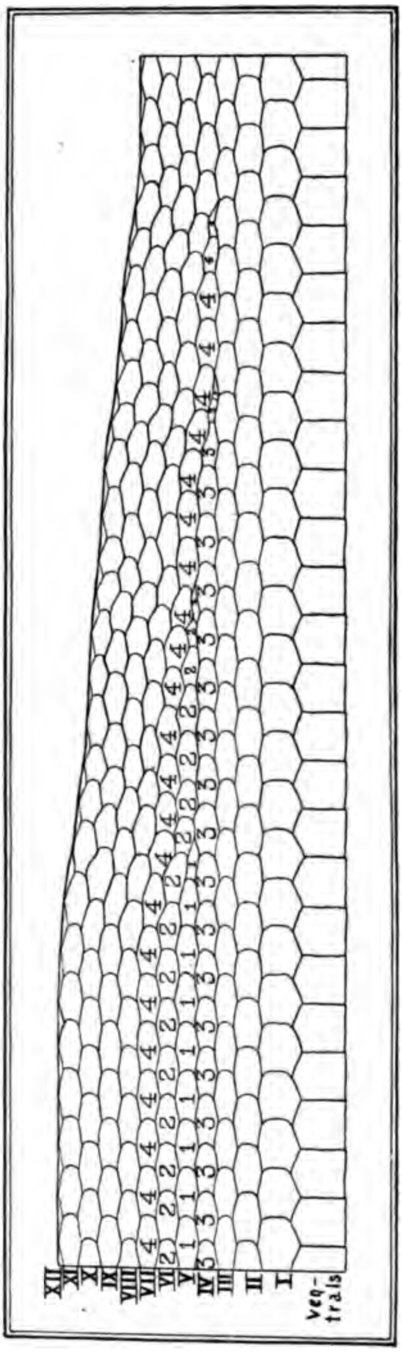


FIG. —DIAGRAM ILLUSTRATING THE ARRANGEMENT OF THE DORSAL SCALE ROWS IN THE GARTER-SNAKES. THE FIGURE MAY BE TAKEN AS REPRESENTING A SECTION OF THE TRUNK, EITHER ANTERIOR OR POSTERIOR FROM THE MIDDLE OF THE BODY, OF A HYPOTHETICAL INDIVIDUAL WITH THE MAXIMUM AND MINIMUM NUMBER OF ROWS FOR THE GENUS.

In certain forms the maximum number of scale rows is known to be very constant. For example, specimens of *sirtalis*, *eques*, *proximus*, *sauritus*, or *sackeni* are but very rarely found that have either more or less than 19 rows anteriorly, but, notwithstanding the fact that most of the other forms are also usually described as having a definite number of scale rows, there is considerable variation in this respect. If a specimen of *megalops* with a maximum number of 23 rows be examined it will be found that this number only occurs on the middle of the body, owing to the fact that the fifth row is dropped anteriorly as well as posteriorly, thus making a formula of 21–23–21–19–17, counting the

maximum number of rows on the different parts of the body.[a] Similarly also in variable forms that have a maximum number of 21 rows, the fifth is often dropped anteriorly as well as posteriorly, giving a formula of 19–21–19–17. In the forms having a maximum of 19 rows the formula may be 17–19–17–15, with the fourth row shortened anteriorly as well as posteriorly, while in those in which 17 is the maximum it is also the fourth that is dropped anteriorly when there are but 15 anteriorly. The abridged row when shortened anteriorly varies in length, and may extend nearly to the head or be abbreviated so as to include but a few scales on the middle of the body. This suggests at once that among the specimens in a given locality those in which a certain row is dropped anteriorly as well as posteriorly represent an intermediate condition between those in which this row is continued to the head and those in which the maximum number is one row on either side less than the maximum for the locality, the decrease being brought about by the loss of the first abridged row in the maximum formula. To illustrate, individuals of *radix* from the vicinity of St. Louis, Missouri, may have the formula 21–19–17, 19–21–19–17, or 19–17, the length of the fifth row varying in the specimens with 19–21–19–17 rows from a few millimeters to include the entire anterior half of the body, and we can only conclude that the formula 21–19–17 is a result of the continuation of this row to the head, while in specimens with 19–17 rows it is entirely lacking.

It is thus the first abridged row that is shortened and lost in the decrease in the number of scale rows, and as this row, as we have previously seen, generally ends a little beyond the middle of the body, it is evident that most of the shortening must take place at the anterior end of the row. There is, however, a posterior shortening of the second abridged row, for upon the disappearance of the first short row the second abridged series becomes the first, and its posterior end must move up toward the middle of the body to retain the symmetry. This variation in the maximum number of scale rows may be summarized as follows: *The decrease in the number of rows of dorsal scales among the garter-snakes of a given locality is due to the anterior shortening and subsequent loss of the first row of scales that is dropped posteriorly in each snake having the next higher scale formula.*

I have been unable to discover any sexual variation in the number of scale rows, but in many cases an examination of large series reveal distinct geographic differences in this regard. Thus in the great plains region *radix* exhibits the scale formulas 21–19–17 or 19–21–19–17, but in the prairie region to the east a decidedly larger proportion of specimens have 19–21–19–17 rows, while near the eastern limits of its range the formula 19–17 is occasionally

[a] In the following paper the rows will be numbered from the gastrosteges each time.

encountered. More than this on the eastern boundary the species is replaced by a smaller form (*butleri*) which is not known to have a higher formula than 19–17. I will not take the space here to give further illustrations, as they will develop in the consideration of the various forms. It is sufficient to say that the geographical variation in the number of scale rows, shown to occur in *radix*, also occurs in many other forms in the genus. Since the geographic variation in the number of scale rows is brought about in the same manner for the various forms as in the individuals of a given locality, and it further develops that these forms at points in their range where the number of scale rows is at a minimum or maximum often grade into, or are replaced by, other evidently nearly related forms with a smaller or larger number of rows, the conclusion seems to follow that the *racial differences in the number of dorsal scale rows in the garter-snakes are the result of the loss of the abridged rows in the order in which they are dropped posteriorly in individuals that have the maximum number of rows for the genus.*

At first sight it appears rather odd that the first abridged row should end so constantly just beyond the middle of the body, and that any further decrease should take place from the fore backward, but an explanation presents itself. As has been previously stated, the reduction in the number of rows posteriorly is correlated with the taper of the body. If, therefore, we consider that there is also a slight decrease in the size of the body anteriorly that culminates in the constriction of the neck, the tendency for the rows to drop out anteriorly may be considered analogous to their abridgment posteriorly. This anterior taper is slight and not sufficient in many specimens to make a difference in the number of rows between the neck and body, in which case the first abridged row extends to the head, but it is apparently such that a decrease in size would effect the scale rows here before on the middle of the body. There is no noticeable difference in the size of the scales between individuals with a greater or fewer number of scale rows, but it is very noticeable that those forms which possess the smallest formula in the genus are distinctly the smaller in size, and the opposite. It seems safe to conclude, therefore, that the loss of the rows is correlated with a general decrease in the size of the body, and that in the decrease the number of rows is influenced by the necessity of maintaining the symmetry of the body, so that the decrease is noticeable first on the anterior and posterior parts of the body, owing to the comparatively smaller size of these parts. Whether or not such dwarfing takes place we will be more able to judge when the evidence of the other characters and the forms themselves have been examined.

However, since, as I shall show later, the males are smaller, more elongate and less stocky in form than the females, a tendency toward a reduction in the number of scale rows should, it seems to me, be revealed first in the former sex. This point is difficult to test, for extensive series are wanting in most regions where such a reduction is inaugurated, and in a region where the reduction is great enough to markedly influence the females the difference between the sexes would be obscured, since there is not enough difference in relative size to give the males the next lower formula. A series of specimens of *radix* from Palo Alto and Clay counties, Iowa, however (where, as will be shown later, there is a slight tendency toward a reduction in the number of scale rows from 21–19–17 to 19–21–19–17), seem to confirm our reasoning, for out of seventeen males thirteen have the formula 19–21–19–17, as against 21–19–17 in the others, while out of thirty-five females but six have this formula, the remainder having 21–19–17. This matter should receive further study.

The law of variation to which the scale rows are subject may be formulated as follows: *The individual, geographic, and racial variations in the number of dorsal scale rows in the garter-snakes is brought about by the shortening and loss of the same scale rows as are ordinarily dropped posteriorly in conformity with the taper of the body, and there is evidence that this decrease is due to a dwarfing of the body.*

It should be pointed out that the adjustment of the scale rows to the taper of the body shown in these snakes is very similar to the plate arrangement observed in certain Palæechinoids by Jackson and Jagger (1896). If our diagram (fig. 1) be compared with their diagram of the ideal arrangement of interambulacral plates in *Melonites multiporus* (p. 164) it will be seen that the rows dropped posteriorly in the snakes are almost exactly in the middle (of each side), as the rows of interambulacral plates which are discontinued toward the ventral end in the echinoids are in the middle of the interambulacral area, so that the order in which they are dropped in the snakes and echini is exactly the same. In the echinoid figured, owing to the pronounced constriction dorsally, the columns of plates are distorted, but continue to be represented—a feature that is not shown in those garter-snakes in which the maximum number of rows continues to the head, possibly because the constriction of the neck is too slight to disturb the rows. That a dying out of columns also occurs in echinoids, however, is stated by Jackson and Jagger, and it is very interesting to note that "when columns die out or cease to be continued to the dorsal area it is commonly the middle or last added column which drops out first in the cases observed," which is exactly analogous to the dropping of the scale rows anteriorly in the garter-snakes.

Variation in number of labial plates.—The number of labial plates (fig. 2) in the garter-snakes varies from 6 to 9 above the mouth and 8 to 11 (very rarely 12) below, each of the numerous forms tending to have a certain definite number, as in the case of the scale rows. For the latter reason the number in each of these series is often used as a diagnostic character, but, owing to the fact that individual variations are not uncommon, this trait has been accorded only secondary importance, while of the two the number of supralabials is considered of more taxonomic importance, as it is noticeably less variable. There seems to have been little attempt, however, to determine the nature of these variations.

In almost any locality a series of specimens [a] will reveal differences in the number of these plates. Thus, in *proximus*, while the labial formula [b] in the great majority of specimens from the same region is 8/10, there may be 7 upper and 9 or 11 lower labials. In *sauritus* the formula is mostly 7/10, but specimens with 8 superior and 9 or 11 inferior labials occasionally occur. Again, *ordinoides* specimens from the same locality may have 6, 7, or 8 superior and 8, 9, or 10 inferior labials. The variability shown by these forms is typical of all of the forms in the genus, and it will be seen at once that the amount of individual variation is very slight. In the case of the lower labials the difference indicated in the specimens from the same locality may consist of both a loss and an addition of a scute to the normal number for the locality, but it rarely exceeds this amount. In the case of the supralabials, however, the difference shown by specimens from the same locality usually consists of either an increase or decrease of one scute, it being rarely that the variation occurs both above and below the normal number for the region.

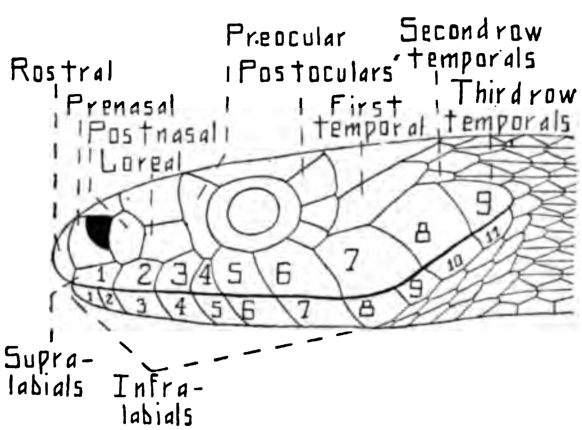


FIG. 2.—THE ARRANGEMENT OF THE HEAD PLATES IN THE GENUS THAMNOPHIS, AS REPRESENTED IN AN INDIVIDUAL POSSESSING THE MAXIMUM NUMBER OF LABIAL PLATES FOR THE GENUS.

This apparent definiteness in the variation in the number of upper labials at once suggests the presence of some controlling factor. It

[a] The following discussion may be followed on the diagram that forms fig. 3.

[b] The labial formula is the number of scutes in each series, and is expressed as a fraction; for example, 8/10 means 8 supralabials and 10 infralabials.

can not be sex, for in no instance where large series have been examined has it been possible to detect any correlation between the number of labials and the sex of the specimens. On the other hand, when the racial differences are examined the apparent definiteness in the individual variation of the upper labials is seen to be extended also to the lower. Thus, in *proximus*, which as a form has 8, occasionally 7, supralabials, and 10, but also 9 or 11, infralabials, the presence of 9 lower labials occurs much less frequently than 11 throughout most of the range, while in *sauritus*, on the other hand, in which the upper labials are 7, occasionally 8, and the lower 10, occasionally 9 or 11, specimens with 9 infralabials are much more abundant than those with 11. *Sauritus* thus exhibits a tendency toward a smaller number of lower as well as upper labial scutes than *proximus*. Furthermore, where the ranges of these forms meet and the forms intergrade (in Illinois, for example), the specimens appear to be about equally divided in the possession of 7 or 8 supralabials, while the infralabials are normally 10, with the occasional variations 9 and 11 about equally disposed. This at once suggests that these variations are geographic.

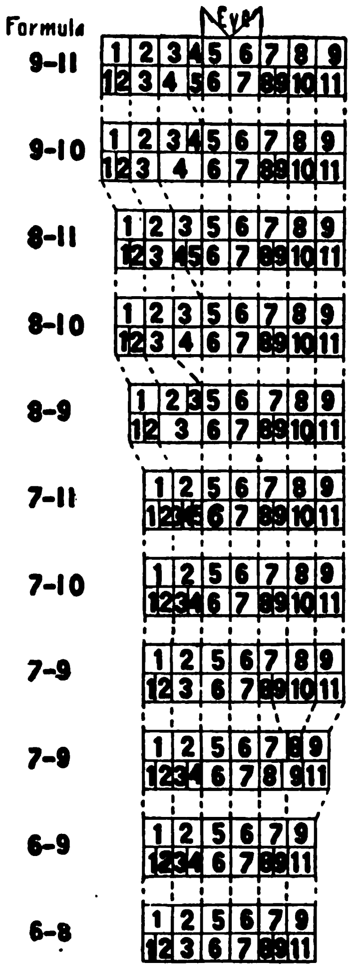


FIG. 3.—DIAGRAM SHOWING THE METHOD OF VARIATION IN THE NUMBER OF LABIAL SCUTES THAT RESULTS IN THE FORMULAS CHARACTERISTIC OF THE DIFFERENT FORMS OF GARTER-SNAKES.

It is difficult to demonstrate a geographic variation in the number of labial scutes within the different forms, for the amount of the individual differences is usually equal to any geographic variations that exist in the same form. This necessitates the examination of large series of specimens to obtain as near as possible the mean number for each locality, for in small series of specimens slight fluctuations in the locality averages, due to the accidental preponderance of specimens with the same number, are sufficient to obscure any geographic trend in the variations. In certain intergrading forms, however, it is possible to show that geographic differences do occur within the form. There is good reason to believe,

for example, that the forms known as *elegans* and *ordinoides* intergrade in eastern Washington and Oregon, *elegans* extending to the east of this region and *ordinoides* westward to the coast. In *elegans* the labials are normally 8/10, but in *ordinoides* they are generally less, so that there is evidently a decrease in the number of these plates in the region where these forms intergrade. This is shown when specimens from the eastern part of the range of *ordinoides* are examined. Thus, on the eastern shore of Puget Sound the upper labials in this form are 7 or 8 (rarely 6), the infralabials 8, 9, or 10, the average for the upper labials in a large series being 7.2, for the infralabials 9. Toward the west coast, however, the number decreases very noticeably, the occurrence of 8 upper and 10 lower labials becomes rarer, the formula tending to become 7/8. This not only indicates a difference between two forms in the number of plates, but also a geographic variation in this trait within the form *ordinoides*. As will be shown later, this occurs in several other forms, and there seems to be good reason, therefore, for concluding that *whatever the factors may be that influence the number of labial plates, the variations are geographic and have been the basis for the racial differences that now exist.* This will come out much more clearly in the consideration of the various forms.

In attempting to discover the factors involved in the variations in the number of labials it is necessary to inquire more closely into the nature of the latter. In the first place it must be noted that the number of upper and lower labials are correlated. For example, in a series of specimens of *ordinoides* from Puget Sound, Washington, all but two out of fifteen individuals with 7 supralabials have 9 inferior labials or less, while out of the eight with 8 upper labials six have 10 inferior on both sides and one 10 on one side and 9 on the other. In most cases, however, the range of individual variation is too small to show this correlation, and it can only be noted in a general way. Thus, a review of the different forms shows that in those with 8 superior labials the inferior labials are normally 9, 10, or 11; in those forms, in which the number of supralabials is 7, the infralabials are 8, 9, or 10, while in those with 6 in the upper series there are usually 8 or 9 in the lower. Thus, although not exact, a correlation between the number of superior and inferior plates very evidently exists, and it can be said that *generally there are normally two or three more scutes in the lower series of labials than in the upper, but rarely less or more than this number.*

This correlation might well be expected from the fact that these two series of scutes border the mouth exactly above and below on either side, and as they thus have the same relative length in each snake, any difference in the length of one series must evidently be correlated with an increase or decrease in the length of the other, and

also in the size of the mouth. While this is true it does not follow, however, that a difference in the size of the mouth is of necessity associated with a difference in the *number* of labials, for it is conceivable that the same result might be attained by an increase or decrease in the size of the individual scutes, without disturbing the number, or the number of plates in each series might be increased or decreased by division or fusion without modifying the size of the mouth. It is necessary, therefore, to determine the method by which variation in the number of labial plates is brought about before the significance of the differences can be discovered.

I may be taken to task for asserting that variations in the number of labials are caused by a decrease in the size and ultimate disappearance of certain plates, for instances of the division and fusion of individual scutes will have been recognized by anyone who has handled a considerable number of these snakes. If, however, the frequent abnormalities, to which all large scales in snakes are subject, be ignored, we believe that it can easily be demonstrated that the normal method of variation in the labials is associated with the decrease in size and ultimate disappearance of certain plates.

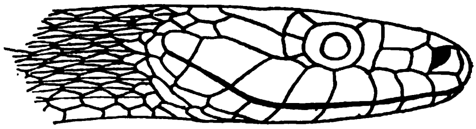


FIG. 4—THAMNOPHIS MEGALOPS (1098 FIELD MUSEUM) SHOWING THE NORMAL ARRANGEMENT OF THE LABIAL SCUTES WHEN THE FORMULA IS 8/10.

As was stated in the general description of the scutellation in the genus, the eye rests directly upon the supralabials, the orbit being above the suture[a] of two adjacent scutes, fig. 2. These labials are said to "enter the orbit," and the particular scutes thus situated are often mentioned in diagnoses. Thus, in *proximus* the fourth and fifth labials enter the orbit, in *sirtalis* the third and fourth, etc. If, however, the relative position of the eye to the supralabials be investigated in the different forms, in connection with the number of scutes in this series, it very soon develops that the general statement can be made that *in all of the forms of garter-snakes with more than 7 supralabials the orbit is bounded below by the fourth and fifth scutes of this series; in those with 7 or less it is the third and fourth that enter the orbit.*

This may mean one of two things, either the position of the eye is constant relative to the two scutes which bound its orbit, and the difference in the number of labials occurs anteriorly, or the variation in the number of labials has taken place behind the eye and has been associated with a change in the position of the orbit. If the position of each superior labial be examined on any snake in which there are 8 in the series, it will be found (fig. 4) that the first

---

[a] In *angustirostris*, in which the orbit is separated from all but one labial by the forward prolongation of the lower margin of the lower postocular, the relative position of the eye is the same, as it is still directly above the suture of two labials.

extends from the rostral to some point below the posterior nasal scute, the posterior margin of the second ends under the loreal, the third under the preocular, the fourth under the eye, the fifth under the postoculars, the sixth under the first temporal, the seventh under the second temporal, and the eighth under the second scale behind the first temporal, which may be termed, for convenience, the lower scale of a third row of temporals. In all of the forms with a normal number of 8 supralabials this arrangement is the rule, and specimens are seldom observed in which the margins of the scutes are outside of the limits of the plates mentioned above, although slight deviations in this way do occasionally occur. Now, when there are 9 supralabials, as in many specimens of *megalops*, the margin of the extra scute in every case observed is situated entirely within the limits of the preocular (fig. 5). This is always smaller than the adjacent scutes, and is always and only present when there are 9 labials in the series, so that there can be no question that it is the one that is added.

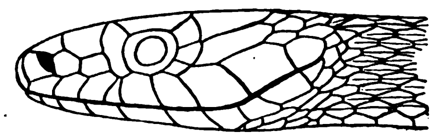


FIG. 5.—THAMNOPHIS MEGALOPS (1098 FIELD MUSEUM), SHOWING THE SMALL SIZE OF THE FOURTH SUPRALABIAL WHEN THERE ARE NINE IN THIS SERIES.

If now a series of specimens of any form in which the supralabials are normally 7 and occasionally 8 (*radix*), or usually 7 and frequently 8 (*ordinoides*), be scrutinized, it will often be noticed that in the specimens with 8 the third is frequently decidedly narrower than the second or fourth (fig. 6). Both in front and behind the eye in such specimens the supralabials are arranged exactly as in those which have normally 8, except that the common suture of the second and third occurs near the posterior margin of the loreal, thus narrowing the third plate very decidedly. In these forms when there are but 7 scutes there is either no labial suture below the loreal, the second plate extending from the posterior nasal to the preocular, or the posterior margin of the first labial is moved slightly backward so as to lie under the extreme anterior part of the loreal (fig. 7). There can be no doubt, therefore, that the decrease in the number of supralabials from 8 to 7 is in these cases due to a loss of the third scute and that the method of this loss consists principally of a narrowing of this

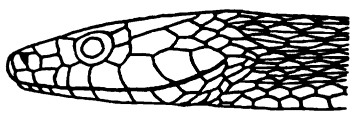


FIG. 6.—THAMNOPHIS ORDINOIDES (1109 FIELD MUSEUM), SHOWING THE REDUCED THIRD SUPRALABIAL—THE FIRST STAGE IN THE REDUCTION FROM 8 TO 7.

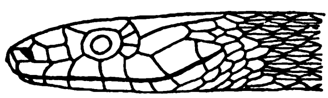


FIG. 7.—THAMNOPHIS SAURITUS (32972 UNIVERSITY OF MICHIGAN MUSEUM), SHOWING THE NORMAL ARRANGEMENT OF THE LABIAL SCUTES WHEN THE FORMULA IS 7|9.

plate. That fusion also plays a part is also very evident, however, as illustrated by fig. 8, but that this usually takes place only when the plate in question has become much reduced in width also appears evident, for specimens have not been observed in which either of the adjacent plates were strikingly enlarged, as must have been the case had this plate fused with either of its neighbors before becoming reduced.

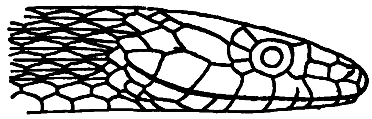


FIG. 8.—THAMNOPHIS ORDINOIDES (1109 FIELD MUSEUM), SHOWING THIRD SUPRALABIAL REDUCED AND PARTLY FUSED WITH THE FOURTH TO LEAVE SEVEN.

The fact that the adjacent plates are not noticeably larger in specimens with 7 than in those with 8 supralabials also makes it very probable that with this loss of a supralabial in front of the eye there is associated a shortening of the muzzle. In forms which have normally 7 the arrangement is exactly the same as in specimens with 7 in the forms which have 7 or 8 (fig. 9).

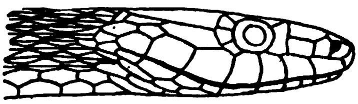


FIG. 9.—THAMNOPHIS SIRTALIS (30820 UNIVERSITY OF MICHIGAN MUSEUM), SHOWING THE NORMAL ARRANGEMENT OF THE LABIAL SCUTES WHEN THE FORMULA IS 7/10.

There is but one form (*butleri*) in which the supralabials are very frequently 6, but *radix* (and apparently also *ordinoides*) occasionally exhibits a tendency to have less than 7. If a specimen of *radix* or *butleri* (fig. 10) with 6 labials be examined, it will be found that the first four scutes are arranged exactly as in specimens with 7 (fig. 7). The fifth plate, however, is somewhat wider than usual, extending to beyond the middle of the first temporal instead of in front of it, while the next, which is now the last, extends to the middle of the third as usual.[a] In *butleri*, and frequently in *radix*, when there are 7 labials the same arrangement of the scutes is adhered to, except that the fifth in these individuals extends from the postocular to a point in front of the middle of the first temporal (its normal position in forms with 7 scutes in this series), while the next extends from here to beyond the middle of this scute, the last retaining the position which it has in specimens with 6 labials (fig. 11). It would seem from this that the decrease in the number of labials from 7 to 6 has resulted from

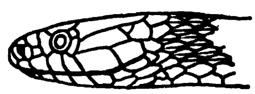


FIG. 10.—THAMNOPHIS BUTLERI (226 RUTHVEN COLLECTION), SHOWING THE LARGE FIFTH SUPRALABIAL CAUSED BY THE DECREASE IN SIZE OF THE PENULTIMATE SCUTE AND ITS FUSION WITH THE ANTEPENULTIMATE LABIAL.

[a] In many specimens of *butleri* the last labial ends below the single large second temporal, but this scute has very evidently been formed by a fusion of the scales which usually constitute the first and second rows behind the first temporal, so that the relative position of the posterior margin of the last supralabial in respect to these scales is the same as in other forms which do not have a single temporal in the second row.

the fusion of the penultimate and antepenultimate scutes. While such a fusion undoubtedly exists, however, it constitutes but a part of the story; for, if simply a fusion of these scutes took place, the fifth, in individuals with 6 labials, should extend from the postocular to the second temporal, while, as it is, it only extends a little beyond the middle of the first temporal, being thus but slightly larger than in specimens with 7. A reduction in the size of the penultimate scute must therefore take place at some time during the process of reduction in the number from 7 to 6. A series of specimens of *butleri* and *radix* from the common boundary of their range, where, as we have seen, a reduction in the number of labial plates from 7 to 6 takes place, will illustrate this process in all of its stages. Thus, in most of the specimens with 7, the penultimate scute extends from the anterior part of the first temporal to the second row of temporals, the normal arrangement for this number of labials (fig. 9). In other specimens (fig. 11) this labial extends only from the anterior part of the first temporal to beyond the middle of this scute, while in still others the reduced penultimate scute is partially fused with the antepenultimate one (fig. 12). As the posterior margin of the penultimate plate, in specimens with 6 labials, generally comes in contact with the first temporal at about the place where the posterior margin of the sixth occurs in the specimens in which it is much reduced, the next step in the reduction of this plate would seem to be its entire fusion with the preceding scute to leave 6 (fig. 10).[a] Therefore *the reduction in the number of labial scutes from 7 to 6 in the garter-snakes is brought about by the narrowing and loss of the sixth; and as there is not a corresponding increase in the size of the neighboring scutes, this decrease in the number of labials must be accompanied by a shortening of the mouth behind the eye.*

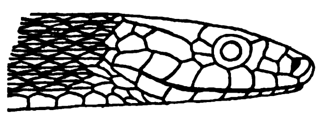


FIG. 11.—THAMNOPHIS RADIX (155 RUTHVEN COLLECTION), SHOWING SIXTH SUPRALABIAL NARROWER THAN USUAL AND ENDING ON THE FIRST INSTEAD OF THE SECOND TEMPORAL.

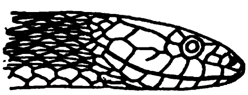


FIG. 12.—THAMNOPHIS BUTLERI, SHOWING THE LAST STAGE IN THE LOSS OF THE SIXTH SUPRALABIAL—THE FUSION OF THE REDUCED SCUTE WITH THE FIFTH.

From its apparent general occurrence among the different forms, the above described method of variation in the number of supralabials may be formulated in the following general terms: *A reduction in the number of supralabials takes place in the garter-snakes as a*

[a] I have previously noted (Ruthven, 1904, 294) that when there are 7 supralabials in *butleri*, the extra one is apparently formed by the division of the fifth. The explanation for this is now shown to lie in the method of reduction in the number of these scutes from 7 to 6.

result of the narrowing and final loss of the fourth, third, and eighth scutes consecutively, as numbered on a snake with 9 plates in this series.

I have previously noted that the number of labials in the upper and lower series is correlated, and that a reduction in the supralabials is associated with a decrease in the number of infralabials. The method of reduction in the number of the inferior labials is, however, somewhat more obscure, for, owing to the small size of these plates, it is often difficult to detect any decrease in the size of individual scutes, so that in forms with a different number of scutes in the lower series it is very difficult to say just which plates have been lost. Much light can be thrown upon the problem, however, by correlating the position of the individual plates of the two series.[a] If a specimen of *megalops* with the labial formula 9/11 be examined it may be noted that the upper margin of each individual scute in the lower series corresponds almost exactly in width and position to one in the upper series, except that the first and seventh supralabials are above two scutes in the lower series. This arrangement is quite accurately maintained in all of the specimens with this formula examined. If, however, a specimen with the labial formula 9/10 be scrutinized it will be found that, while the same arrangement is for the most part adhered to, the small fourth labial has not in these specimens a corresponding infralabial, but that the preceding infralabial scute (the fourth) extends backward to the posterior margin of the fourth supralabial (fig. 5). Evidently, then, either the third or the fourth infralabials are not present in these specimens, or they have fused into a single scute. Just which method prevails is immaterial, for we hope to show that in other cases, as well as in this one, the reduction in infralabials always takes place beneath the upper labial scute that is being reduced; and as was seen in the case of the upper labials that the upper scute is first reduced and finally fused, it may be taken for granted that it is the corresponding infralabial that is lost.

In specimens with the labial formula 8/10 the third superior has a single corresponding inferior labial scute (fig. 4), and there is in such specimens a condition exactly similar to 9/11 forms, except that the fourth supralabial and its corresponding infralabial (the fifth) are lost. In those rather rare cases where the formula 8/11 is shown, it is interesting to note that there are two infralabials below the third supralabial, so that the arrangement is exactly similar in 9/11 forms except that the fourth supralabial only has disappeared.

In the specimens that show a tendency toward a reduction in the labial formula below 8/10 the third superior, as already noted, becomes

[a] The points brought out in the following discussion are illustrated in the diagram (fig. 3).

noticeably smaller. In such specimens when the formula is 8/9, the reduced third superior scute (as in the case of the reduced fourth in the formula 9/10) has not a corresponding inferior labial, but is included within the limits of the preceding inferior scute, which also underlies the second supralabial. Here again is a loss of an inferior labial scute corresponding in position to a reduced superior labial.

As already seen, it is the reduced third supralabial that is lost to make 7 upper labials, and in the specimens with the formula 7/9 the disposition of the inferior plates in front of the eye is exactly as in the formula 8/10, except that the inferior labial corresponding to the third supralabial in the 8/10 specimens is lacking (fig.7), and likewise the same as in 9/11 specimens, except for the loss of the fourth superior and its corresponding inferior scute. In specimens with the formula 7/10 (fig. 9), a fourth infralabial is present, but with the third lies entirely under the second supralabial, while in 7/11 a third, fourth, and fifth may be seen beneath the second supralabial.

Up to this point the reduction in the number of inferior labials, as in the case of the upper labials, has taken place in front of the eye. When the labial formula is 7/9, however, and the penultimate superior labial is narrowed, there is likewise a reduction in the width of the penultimate scute in the inferior series. When the small penultimate supralabial has disappeared, leaving 6, an infralabial scute also tends to disappear, leaving 8, and the same arrangement as in 7/9 specimens is attained, i. e., each superior labial except two are situated above an infralabial (fig. 10); but in this instance it is the first and penultimate supralabials which have two corresponding inferior scutes, instead of the first and antepenultimate, as in other instances. In this instance, however, it frequently does not appear that the lost inferior labial is the one corresponding in position to the lost supralabial, for in many 7/9 specimens in which the penultimate supralabial is reduced in size the penultimate inferior labial extends partly under the antepenultimate superior scute, thus occupying the place of the posterior small inferior labial that usually underlies this scute and with which it has evidently fused. The penultimate infralabial is, however, first reduced in size at the same time that the corresponding supralabial is pushed forward in the process of reduction, so that it may be considered as the one that is lost in the reduction in the number of infralabials from 9 to 8.

The reduction in the number of lower labial scutes in the garter-snakes thus takes place in exactly the same manner and at about the same time and place as the decrease in the number of superior labials, which explains the existing correlation in the number of plates in the two series. Examining the diagram (fig. 3) as a whole, it may be seen (1) that the reduction in the two series takes place at about the same time and place, and in the following order from the maximum number:

4/5, 3/4, 8/10; (2) that the loss of the scutes in both series takes place first in front and then behind the eye, which retains the same position in regard to the superior and inferior plates; (3) that as the reduction consists of a decrease in the size, and final loss, of the disappearing scutes, without a corresponding increase in the size of the remaining scutes, a contraction of the mouth is necessarily associated with the decrease in the number of labials. We can even go farther than this, however, for in these snakes the posterior angle of the mouth extends practically to the posterior angle of the jaw, which in turn marks the extreme posterior limit of the head. This is shown externally by the fact that the cephalic plates never extend beyond the posterior angle of the mouth. Since the number of labials is correlated with the length of the mouth, which extends the entire length of the head, it logically follows that the number of labials is also an expression of the head length.

It is very difficult to prove the existence of any geographic or racial differences in the length of the mouth or head by actual measurements, as these differences must in most instances be very slight, as indicated by the limited range of the variations in the number of labials. It is apparent, however, that such differences exist, for two forms, *butleri* and *ordinoides*, are characterized by the noticeably small size of these features, and it is to be noted that besides being the only forms in the genus with a decidedly small mouth and head, these forms also possess the smallest number of labials, and if a comparison be made between these rather extreme forms and their nearest relatives, *radix* and *elegans*, a difference in the length of the head and mouth may be readily seen.

From the above discussion of the method of variation in the number of labials the law of labial reduction for the genus may be formulated as follows: *The differences in the number of labial plates in the garter-snakes is the result of the loss of corresponding superior and inferior labial scutes, the loss taking place both in front and behind the eye, thus resulting in a shortening of the mouth and head toward this organ.*

Variation in number of ventral and subcaudal plates and in proportionate tail-length.—As previously stated, there is a single series of large scutes on the belly and two rows of smaller ones on the ventral surface of the tail. The number of scutes in each of these series has been considered of systematic importance, and it is true that each form has a definite number within limits. The range of individual and sexual variation is so great, however, and the racial differences generally so slight that large series must be examined from each locality to determine geographic variation.

The number of ventrals is apparently less variable than the subcaudals. There is some sexual difference, as may be determined by an examination of a series of specimens from any locality, but the

limits of this variation overlap considerably owing to the individual variation. Thus, in a large series of *radix* from Clay and Palo Alto counties, Iowa, the ventrals in the females range from 148–166, in the males from 160–172. In order to determine whether or not geographic variation occurs in a species it is necessary to note the proportion of sexes in the locality averages, since a predominence of either obscures slight geographic differences. It can be shown, however, that geographic variation not only exists but that it is correlated with the reduction in the scutellation shown above. Concrete examples will be brought out in considering the different groups. It is only necessary to point out here that all of the forms which have a much reduced number of dorsal scales and labial plates have also a proportionately small number of ventral plates, and the opposite.

On account of their greater variability, therefore, the number of scutes in this series is a trait which is less useful to the student than the number of dorsal scale rows and labial scutes, and, while by no means valueless, is to be used principally to substantiate the evidence of the other characters, when allowance has been made for the disturbing factors of individual and sexual variations.

The variation in the number of subcaudals is of the same nature as that of the ventrals in that the number is greater, as a rule, in males, the extremes of variation in the two sexes overlap, and the individual variation is considerable. In the case of the urosteges, however, the number is not always correlated with the reduction in the scutellation, but with the tail length, which may vary to some extent irrespective of the body. The most pronounced case of this is in the intergrading varieties of the ribbon-snake group. *Sauritus* in Michigan has a proportionately longer tail and more subcaudals than the southwestern form *proximus*, which has more ventrals and labials and attains a much larger size. The character has thus always to be checked up with measurements, but it is not valueless, for when the same proportionate length of tail is maintained the number of urosteges is correlated with the rest of the scutellation. Happily the proportion of tail to body length is quite constant throughout the genus; the only exception being the ribbon-snakes, which usually have a tail length of .27–.38 of the total length and are sharply separated by this and the large number of urosteges from the rest of the species in the genus, which have a tail length of .19–.27, the females of the former approaching the males in the latter.

Variation in number of preoculars and in arrangement of lateral spots.—The number of preoculars has been employed but little in specific diagnoses, although it has been used frequently in descriptions. The explanation for this is to be found in the fact previously stated that in most of the species in the genus there is but a single plate in front of the eye. Certain forms, however, (*me-*

lanogaster, *angustirostris*, *hammondi*, *ordinoides*, and *elegans*) either quite constantly or in some part of their range, exhibit more than one preocular. Whatever may be the cause of this division of the preocular, other evidence, as will be shown later, appears to indicate plainly that these forms are closely related, so that the presence of two or more preoculars over all or a part of the range separates them from all others in the genus.

Although the arrangement of the lateral spots are usually referred to in descriptions, the character is entirely too variable to be used extensively in diagnoses. As before stated, when distinct they are in the form of two rows of alternating spots on either side between the stripes. In forms where they are ordinarily distinct, however, they may be fused to a variable extent in melanic individuals, while being more than usually prominent in light-colored ones. While they are thus quite variable individually, they also exhibit some racial differences. Thus, in *parietalis* the upper row is usually fused into a band, and in *eques*, *sirtalis*, and *parietalis* the first few anteriorly frequently tend to fuse with their neighbors in the opposite row to form crossbars. In two forms the arrangement has become modified into a series of transverse blotches that usually in one form (*scalaris*) stop at the dorsal stripe but in another (*phenax*) crosses the back and fuses with its fellow on the opposite side, forming crossbars. As in the case of the number of preoculars, not enough is known about the factors which influence the arrangement of these spots to enable us to pin our faith to them as indicative of racial affinities; as also with the number of preoculars, however, the fusion of the spots into transverse blotches for the entire length occurs in forms which other evidence seems to indicate are closely related, so that the presence of this arrangement seems to group these forms in a natural way. Furthermore, I believe (my reasons are given on pp. 120–158) that the forms that have this arrangement of the lateral spots are directly related to those that tend to have more than a single preocular, in which case the two characters when used together serve to define a natural section of the genus.

Variation in stripes.—Ever since the establishment of the genus *Eutaenia* by Baird and Girard, the possession of three longitudinal light color bands has been considered a distinctive feature of the genus and the particularities of these stripes used as diagnostic characters. They are, as we have seen, disposed as a single dorsal and two lateral bands, the dorsal covering the median and usually more or less of the adjacent rows, when present, the laterals a varying amount of the second, third, and fourth rows on either side.

The peculiarities of the dorsal stripe that have been used in systematic work are its presence or absence and width, and these char-

acters are fairly constant in the different forms. For example, in *marcianus*, *ordinoides*, and *elegans* it is usually narrow, while in *radix* and *sirtalis* it is decidedly wider, and while it is present in most groups, it is almost universally absent in *hammondi*, *melanogaster*, and *sumichrasti*. It is thus often of considerable value in distinguishing the different forms that occupy the same region. Even in its more general aspects, however, it is unreliable as a test of affinities, as is attested by the considerable range of variation in width which it frequently exhibits in the same form. Indeed, in some instances it tends to be nearly or entirely lost in certain parts of the range of a form in which it is elsewhere distinct, so that an attempt to use it as a test of genetic relationships must result in the grouping together of widely divergent forms. The causes of these variations in the dorsal stripe are difficult to trace without a knowledge of habitats. In certain melanistic forms, such as *concinnus*, it is present, but narrow. On the other hand, in certain quite pallid types (*elegans* and *eques*) it is also quite narrow. As a rule, however, in most melanic forms it is either narrow, obscure, or absent, although it is also obsolete in at least one form in the mountains of Mexico (*sumichrasti*) which is decidedly not melanistic.

It is hardly possible to plot on a map the regions where the dorsal stripe tends to be lost, for the tendency varies with the form, while in the case of melanism the cause is apparently not always a climatic one. For example, in northeastern United States the genus tends to become decidedly darker colored. In *sirtalis* specimens this darkening of the general color is associated with the narrowing and frequent loss of the dorsal stripe, but no such tendency is exhibited by *sauritus*, which occupies the same region. Similarily, also, although *sumichrasti* on Mount Orizaba has lost its dorsal stripe, it is distinct in *scalaris* specimens from the same region. The forms of the Mexican plateau all usually show the dorsal stripe distinctly with the exception of *melanogaster*, in which it is characteristically lacking. In this form, however, it accompanies a melanistic coloration which can not be due to climate, as this is a desert region, but is possibly associated with the more aquatic habitat of this form. In this connection it is interesting to note that the dorsal stripe in *megalops*, in which the dorsal is generally very well defined, is usually very much obscured in specimens taken from Lakes Chalco and Patzcuaro, Mexico, where the form tends to be much darker, and also seems to be quite aquatic in its habits. The conclusion seems justified, therefore, that the dorsal stripe is probably modified by several factors, one of these being the general darkening of the body color. At any rate, the same peculiarities arise independently in different forms not directly related, thus invalidating these characters as indications of affinities.

As in the case of the dorsal stripe, the position of the lateral color bands has been made the basis of specific diagnoses, for it was apparently recognized quite early that the position of these stripes was constant in the different forms. Thus, Baird and Girard (1853) noted that in the ribbon-snakes its position was on the third and fourth rows, in distinction from the other forms then known, in which it was upon the second and third rows;[a] while Cope, Brown, Stejneger, and others have continued to make use of it as a distinctive character as the genus became enlarged.

The position of this stripe has been reported by Taylor (1892, 320) to be subject to occasional variations (apparently meaning here individual variation), but this conclusion may probably be taken as a result of an attempt to group specimens of apparently similar but in reality distinct forms, for there can be no doubt of the really remarkable fixity of this trait. In not a single specimen in the 3,000 that have been examined has the position of the lateral stripe varied as much as a single row from the normal for the form.[b]

There seems to be some evidence that the position of this stripe is affected by the factors that influence the dorsal, for in northeastern, northwestern, and southwestern United States, and the mountains of eastern Mexico there is a tendency toward a narrowing and loss of the lateral stripe in certain forms, that closely parallels similar conditions in the dorsal band. This is not other than is to be expected, from the fact that the stripes very probably have the same physiological significance, but, be this as it may, the extent of the modifications is so decidedly less in the case of the lateral stripe that there are but two forms (*angustirostris* and *phenax*) known at the present time in which it is characteristically absent, none in which it is on other than the second, third, and fourth rows, two (*marcianus*, *butleri*) in which it is difficult to say whether it is upon the second and third or third and fourth rows, and but one (*butleri*) of the latter in which there can be much question as to which of the two positions it is to be referred.

The position of the lateral stripe is thus apparently a very good and reliable specific character, owing to its constancy within the

---

[a] Baird and Girard erred in classing *radix* (the only form listed in the Catalogue of North American Reptiles besides the ribbon-snakes that has the stripe on the third and fourth rows) with those having the bands on the second and third rows.

[b] Hay (1892, b522) records a specimen of *sauritus* from Wabash County, Indiana, which had the stripe on the fourth and fifth rows. It should be noted, however, that this snake had also 21 scale rows, which is such an unusual number among the ribbon-snakes that in the large numbers examined we have never observed a specimen with over 19. It is thus very probable that the individual was abnormal as regards the arrangement of the dorsal scale rows, and the possibility is at once suggested that an extra row may have been added on either side below the lateral stripe, which would be a decided abnormality.

limits of the different forms. It may still be subject to modifications, however, that cause it to vary between the different forms. Should such changes occur they may be conceived to take place in two ways—either independently or dependently of the scale rows upon which they are situated. If they are independent of particular scale rows, changes in their position might take place either suddenly or gradually. A gradual change ought to show forms that are characterized by a different arrangement of the stripe intergrading with each other in this regard, unless, indeed, they have since become distinct. An examination of the intergrading forms, however, fails to reveal anything of this nature. Thus, *sirtalis-parietalis-concinnus*, *elegans-ordinoides*, and *proximus-sauritus* can be shown to intergrade along their common boundaries, and yet there is no change in the position of the lateral stripes, the intergradents being characterized by the same arrangement of these bands. Similarly, also, in the case of the forms now apparently isolated (*megalops* and *hammondi*, for example, see pp. 123 and 137) the evidence of the other characters and of geographic probability point much more strongly toward a relationship with the forms in which the lateral stripes have the same position than with others. These evidences of relationship also argue against the possibility of a sudden change in the position of the stripes as regards the scale rows, for, as far as I can see, there is no evidence of relationship between any two forms with the bands on different rows that is strong enough to require us to adopt this view for which we have no direct evidence. This apparent constancy in the position of the lateral stripes both within the different forms and between related forms gives strong support to the view that these bands are closely associated with particular scale rows.

Even if the lateral stripes are associated with certain scale rows, however, there is still the possibility that their position may be changed by the loss or addition of certain of these rows, but a moments consideration will show that the chance for any great modification in this way is slight. At present, as we have seen, the fourth is the lowest row to be dropped in the reduction in the number of scale rows. The position of the stripe when on the second and third rows can, therefore, experience no change in a decrease in the number of scale rows from 23 to 15, the range of variation in the genus, for it is only the fourth, fifth, sixth, and seventh that are lost in this reduction.

In those forms in which the stripes are upon the third and fourth there is also little chance for modification, for in but one instance is the fourth row of scales dropped anteriorly to leave 17. It is, however, in this group that most of the modifications in the position of these stripes occur, and these variations are associated

with the reduction in the number of scale rows. Thus, where the fourth row is dropped posteriorly to leave 17 the lateral stripe in one form (*radix*) is left upon the third row only, in two forms (*butleri* and *megalops*) it descends below the third to include the second, while in three forms (*proximus*, *sauritus*, and *sackeni*) it ascends one row after the loss of the fourth, so as to remain posteriorly also upon the third and fourth. In but two forms is the position of the stripes modified anteriorly, and in one of these (*marcianus*) it is apparently due to the general pallidness of the ground color which partially obscures it; in the other (*butleri*) we have the only decidedly dwarfed representative of the forms which have the stripe upon the third and fourth rows. When the scale formula in *butleri* is 19–17, the lateral stripe is anteriorly upon the third and the margins of the second and fourth rows, posteriorly upon the second and third. When the scale formula is decreased to 17–19–17, the lateral bands are anteriorly and posteriorly upon the second and third rows, on the middle of the body being still upon the second, third, and fourth. In the forms that have the lateral stripes upon the third and fourth rows there is thus apparently exhibited a tendency toward producing a form with the stripe upon the second and third rows, but as this only takes place in the most dwarfed forms and is evidently due to dwarfing it can in no way be taken as lessening the gap between the groups that have it upon the second and third, and those in which it is upon the third and fourth, for it would be absurd to maintain that the former were dwarfed descendants of the latter, since they are by no means all dwarfed forms.

I have shown that the other traits (number of scales, color, and tail length) are subject to modifying influences, and although of assistance are not to be depended upon as indicating related groups. If, however, I have succeeded in establishing that the position of the lateral stripe is not affected by the various influences that divide the genus into many and diverse forms, I should find in it a trait that will when availiable give us a true idea of the general relationships of the different forms.[a]

Variation in color.—There is considerable variation in the specimens examined, but this is so largely individual that it is difficult to define a normal color for a form, and, even when there are well marked geographic differences among the forms, those in the same

[a] Coues and Yarrow (1878, p. 273) were apparently the first to point out the significance of the position of the lateral stripe, although they did not pretend that the members of the different groups were genetically related. The following is their statement of the case: "As far as we have seen, the position of the lateral stripe may be a means of grouping the species. Though this varies within certain limits, mainly according to the width of the band, yet its position on the third and fourth, or on the second and third, dorsal rows affords a ready means of distinguishing certain sets of species or varieties." The validity of this statement has been questioned by Taylor (1892, 320), but, as indicated above, his criticism was probably not well founded.

region tend to be similarly colored, as Allen has pointed out a number of times in mammals and birds, so that it is impossible to distinguish them sharply on this basis. The following unquestionable tendencies may be noted:

1. A marked increase in bright colors in the Pacific coast region in Washington, and Oregon, and British Columbia. This is shown by the presence of bright reds and greens (*concinnus, ordinoides*).

2. An increase in the amount of black pigment at the expense of the paler colors in the region just mentioned. This is especially shown in the enlargement of the lateral spots to the obliteration of the interspaces on the skin and a narrowing of the dorsal stripe (*concinnus, ordinoides*).

3. A tendency toward a paler ground color and lighter stripes in the forms inhabiting western Texas, southern New Mexico, southern Arizona, and northern Mexico (*marcianus, eques*).

4. A tendency toward the production of red pigment on the Great Plains (*parietalis* and occasionally *radix*).

5. A tendency toward dark colors in the forest region of eastern United States. This is shown by the prevailing brown ground color in *sauritus* and *butleri*, and the dark greenish and brownish olives in *sirtalis*.

An increased darkness of color thus occurs in the more humid areas, while the paler colors are usually found in the more arid regions; some well marked exceptions occur, however. Thus, in the arid region of northern Mexico *angustirostris* and *melanogaster*, which are very dark in color, occur with the paler *megalops* and *eques*, and in central Texas *proximus* is much darker than *marcianus*. More detailed notes on these forms are needed before much can be done by way of explanation, but it is significant that the dark forms (*melanogaster*, *angustirostris*, and *proximus*) mentioned above as occurring with pale ones in an arid region are known to be more than usually aquatic in habits. We believe that it will be found that the color in these snakes is not, as in mammals and birds, closely correlated with the major environmental complexes, owing to the fact that they prefer damp situations, and are thus not exposed to the same conditions throughout their range as terrestrial mammals and birds. At any rate, owing to the great variability, color is one of the least important characters that have been used in diagnoses.

As is well known, the characters that have been discussed are by no means all that have been used by students of the group to define species. They are, however, those which we have found to be of the most importance. The number of temporals and comparative length of fore and hind chin shields, while both of use in defining certain species, are too variable or the peculiarities of too limited occurrence to permit of their use in a search for general relationships. The

shape of the frontal (i. e., length in relation to width) is also useless as a diagnostic character, owing to its variability; while, as shown above, the position of the eye relative to the supralabials (i. e., the particular labials which enter the orbit) is dependent upon the number of labials in this series.

THE FOUR GROUPS OF GARTER-SNAKES.

It may seem the extreme of "lumping," in view of the thirty forms[a] that are at present recognized by herpetologists, to assert that there are but four great groups or lines of descent in the garter-snakes, but I believe that the evidence is sufficient to warrant the assertion. The first step in the division of the genus into genetic groups is to determine the different associations of traits, or forms, that exist at the present time. This has of course already been largely accomplished in the definition of the species and varieties that have been made, and it remains for us now to assemble these forms into the general groups.[b]

The table that follows expresses all of the different combinations of characters that are shown by these snakes at the present time, and it will be seen that there are nineteen of these combinations or forms recognized. These comprise all of the different forms of garter-snakes that have a geographic range, and disposes of the multitude of forms that have been described upon the basis of individual or sexual variations.

---

[a] This number has been attained by adding the better defined Mexican and Central American forms to the North American forms admitted by Brown (1901) in his "Review of the Genera and Species of American Snakes North of Mexico" (a conservative estimate).

[b] It is best at the outstart to ignore all questions of species and subspecies until their status is established, and to speak of these as forms. Forms, therefore, in the sense employed in this paper, are actual combinations of traits, having geographic extent, irrespective of whether they are isolated (species) or intergrade with their neighbors (subspecies). Detailed discussions of questions of nomenclature are also omitted, although the names used are in every case the ones that, in the light of the development of these investigations, we judge to be the right ones, following the International Code of Zoological Nomenclature. The proper name of each form will be found in the footnotes, together with the synonymy.

Table to illustrate the combination of traits into forms, groups, and divisions in the garter-snakes.

Position of lateral stripe.	Preoculars and arrangement of lateral spots.	Proportionate length of tail.	Number of dorsal scale rows.	Number of supra-labial scutes.	Forms.	Groups.	Primary divisions.	Genus.
On the third and fourth rows.	Preoculars one and lateral spots not arranged as cross-bars.	Generally less than 27 per cent.	21-23-21-19-17 21-19-17 19-21-19-17 19-17	(9)-8	*megalops*	*Radix*	I	THAMNOPHIS
			21-19-17	8	*marcianus*			
			21-19-17 19-21-19-17 19-17 17-19-17	8-7	*radix*			
			19-17 17-19-17-15	7-6	*butleri*			
		Generally more than 27 per cent.	19-17 17-19-17	8-(7)	*proximus*	*Sauritus*		
			19-17	8-(7)	*sackeni*			
				(8)-7	*sauritus*			
			21-23-21-19-17 21-19-17 19-21-19-17	(9)-8	*angustirostris*			
			21-19-17 19-21-19-17		*hammondi*			

On the second and third rows.	Preoculars two, or lateral spots arranged as cross-bars, in some part of the range.	Generally less than 27 per cent.	21-19-17 19-21-19-17 19-17	8-(7)	*elegans*	*Elegans*	II	THAMNOPHIS
			19-21-19-17 19-17 17-19-17-15 17-15 15-17-15	8-7-6	*ordinoides*			
			19-17	8	*melanogaster*			
				8-7	*phenax*			
			19-21-19-17 19-17 17-19-17-15 17-15	(8)-7	*scalaris*			
	Preoculars one and lateral spots not arranged as cross-bars.	Generally less than 27 per cent.	19-17 17-19-17-15	8-7	*eques*	*Sirtalis*		
			19-17	(8)-7	*sirtalis*			
					parietalis			
					concinnus			
			19-17-15 17-19-17 17-15	8	*sumichrasti*			

In the discussion of the value of the characters an attempt was made to show that the position of the lateral stripe groups related forms, and that the proportionate tail-length, and the number of preoculars and presence or absence of lateral cross-bars,[a] are also of value in this regard, if used within the limits of the groups having the lateral stripe in the same position. If we have made our point, then, the nineteen forms defined in this table fall naturally into four groups, the members of which should be genetically related.

To each of these four groups of garter-snakes we have for convenience given the name of the best known form which it includes. Thus we have the *Radix* group with the lateral stripe upon the third and fourth scale rows and a short tail; the *Sauritus* group with the lateral stripe on the third and fourth rows and with a long tail; the *Elegans* group with the lateral stripe upon the second and third rows, and with either more than one preocular scute in some part of the range or the lateral spots arranged as cross-bars in some part of the range, and the *Sirtalis* group with the lateral stripe on the second and third rows, and never more than a single preocular, or lateral cross-bars.

It will probably be conceded at once that the ribbon-snake group (*Sauritus*) is a natural one, and there can be little question that the forms included in the *Radix* group are also related, although the placing of *marcianus* with these snakes will be seriously questioned by some herpetologists. In the case of the other groups, *Elegans* and *Sirtalis*, the affinities are in many cases much less obvious, but it can not be denied that as thus defined the groups include those forms which are evidently related. Thus there is no question but that *hammondi*, *ordinoides*, and *elegans*, which are here placed in the *Elegans* group, are closely related, nor that *sirtalis*, *parietalis*, and *concinnus*, in the *Sirtalis* group, actually intergrade. The evidence for the inclusion of the other forms in these groups, as well as further proof that the above-mentioned forms are properly placed together, will be given in more detail when the forms are discussed separately, and the lines of interrelationship considered.

The continuous geographic range of the four groups also seems to strengthen the evidence of the characters that they are associations of directly related forms. As is shown on the maps, the *Radix* group occurs on the Mexican plateau, great plains, and in the prairie region; *Sauritus* is a coastal plains group, extending from British Honduras to Maine, only penetrating into the interior in the forests of eastern United States and along the streams of the great plains; the *Elegans* group occupies the Mexican plateau and, in the United States, all of

[a] It has been a source of regret to the writer that a single trait could not be found to separate the *Elegans* and *Sirtalis* groups. Most students of snakes have encountered a similar difficulty, however, for the different groups of snakes, apparently owing to the recency of the order, are frequently not sharply defined by any single difference that is obvious.

the region west of the Rocky Mountains, only occurring east of these mountains on the high plateaus; the *Sirtalis* group occupies the plateau region in Guatemala and Mexico, and in addition practically all of the United States and southern Canada, from the Atlantic to the Pacific. The range of each of these groups, as will be shown later, is made up of the ranges of the component forms placed side by side.

The evidence seems to be quite conclusive, therefore, that these groups are assemblages of directly related forms, and it is necessary now to consider in detail the forms comprising these groups in order to determine the directions of their relationships. If this detailed examination bears out the evidence that the groups are genetic, and reveals the direction of the affinities within the groups, much light should be thrown upon the origin and history of these snakes.

A key is given by which the forms may be recognized.

Key to the forms of the genus Thamnophis.

a^1. Lateral stripe anteriorly upon the third and fourth rows.
- b^1. Tail generally more than .27 of the total length.
  - c^1. Supralabials usually 8.
    - d^1. Tail between .25 and .35 of the total length................*proximus*, p. 98.
      (Illinois to western Nebraska, southward in eastern Mexico to Central America.)
    - d^2. Tail between .32 and .38 of the total length..............*sackeni*, p. 107.
      (Principally confined to Florida.)
  - c^2. Supralabials usually 7..*sauritus*, p. 112.
    (United States east of the 87th parallel, and north of Florida.)
- b^2. Tail generally less than .27 of the total length.
  - c^1. Dorsal scale rows usually 21-19-17, supralabials 8, occasionally 9..... *megalops*, p. 44.
    (Southern Arizona and New Mexico, the plateau of Mexico.)
  - c^2. Dorsal scale rows usually 19-21-19-17, supralabials 7 or 8........*radix*, p. 70.
    (Great plains and prairie regions of central North America.)
  - c^3. Dorsal scale rows usually 19-17, supralabials 6 or 7.............*butleri*, p. 87.
    (Indiana, Ohio, southern Michigan, western Pennsylvania.)

a^2. Lateral stripe anteriorly upon the third row only................*marcianus*, p. 58.
(Central Texas, southern New Mexico and Arizona, northern Mexico.)

a^3. Lateral stripe upon the second and third rows.
- b^1. Dorsal scale rows usually 21-19-17 or 19-21-19-17.
  - c^1. Dorsal stripe usually absent.
    - d^1. Eye in contact with two supralabials...................*hammondi*, p. 133.
      (Southern California and northern Lower California.)
    - d^2. Eye in contact with a single supralabial.............*angustirostris*, p. 120.
      (Northern part of the Mexican plateau, southern New Mexico and Arizona.)
  - c^2. Dorsal stripe usually present..................................*elegans*, p. 138.
    (From the Rocky Mountains to the Sierra Nevada-Cascade Range, inclusive.)
- b^2. Dorsal scale rows usually 19-17 or less.
  - c^1. Dorsal stripe usually present.
    - d^1. Never more than 1 preocular.
      - e^1. Supralabials usually 8.....................................*eques*, p. 158.
        (Guatemala to southern Arizona and New Mexico on the plateaus.)
      - e^2. Supralabials usually 7.

f^1. Lateral spots fused into transverse blotches for the entire length.. *scalaris*, p. 127.
(Southern Mexico and northern Central America.)

f^2. Lateral spots not fused into transverse blotches for the entire length.

g^1. Both rows of lateral spots distinct on the skin; interspaces not generally red .... *sirtalis*, p. 176.
(North America east of 91st meridian and south of the 52nd parallel.)

g^2. Upper row of lateral spots usually fused on the skin; interspaces red.

h^1. Dorsal stripe usually covering one and two half-rows. Width of interspaces on skin equal to the length of one scale ...... *parietalis*, p. 166.
(From the 91st meridian to the Pacific coast, exclusive of western Oregon and Washington, and south of the 52nd parallel.)

h^2 Dorsal stripe usually confined to one row. Width of interspaces on skin generally less than the length of one scale, frequently absent.. *concinnus*, p. 173.
(Western Oregon and Washington.)

d^2 Frequently 2 preoculars.................................. *ordinoides*, p. 147.
(California, Oregon, and Washington, west of the Sierra Nevada-Cascade Range.)

c^2 Dorsal stripe usually absent.

d^1 Dorsal scale rows 19–17.

e^1 Lateral spots fused into transverse bars, which usually extend entirely across the back.. *phenax*, p. 130.
(Veracruz, Mexico.)

e^2 Lateral spots not fused into transverse bars .... *melanogaster*, p. 124.
(Southern Mexico.)

d^2 Dorsal scale rows usually 17–19–17 or 17–15............. *sumichrasti*, p. 164.
(Southern Mexico.)

THE RADIX GROUP (MEGALOPS, MARCIANUS, RADIX, AND BUTLERI).

MEGALOPS.[a]

Description.—The Mexican plateau, possibly on account of its topographic unity, is the home of one of the most homogeneous forms in the genus, notwithstanding the fact that this form has been divided into four species (*megalops* and *macrostemma* Kennicott, and *flavilabris* and *insigniarum* Cope). This form, if we succeed in establishing its unity, should be known as *megalops*, and is undoubtedly the largest of the garter-snakes. It is characterized in general by having the lateral stripe on the third and fourth rows, mostly 21–19–17 scale rows, 8 or 9 supralabials, 152 to 174 ventrals, 60 to 87 subcaudals, and a proportionate tail-length of .20 to .278. There is considerable variation in color, so that no single description can be given that will apply for the form. For detailed description see page 55.

Habits and habitat relations.—As is usually the case among reptiles, but little has been recorded concerning the habits of *megalops*, which

[a] *Thamnophis megalops* (Kennicott), Proc. Acad. Nat. Sci. Phila., 1860, p. 330. Includes *E. macrostemma* Kennicott, *E. insigniarum* Cope, and *E. flavilabris* Cope.

is unfortunate, as a knowledge of its habitat would undoubtedly throw much light upon the explanation of its distribution. At first sight it seems rather surprising that a species of this genus should occur so abundantly in an arid region, and three alternative explanations present themselves. It may be either a distinctive desert type and confined to arid localities even in the more humid (southern) portions of its range, or it may, on the other hand, be addicted to a more aquatic habitat, being confined in the desert regions to the vicinity of water. As a third alternative it may be that the form is able to adjust itself to either arid or moist conditions, a change that if extensive might necessitate a change of habits.

The second explanation is probably most nearly the true one, for the genus is notably inclined toward a moist habitat. Cope in 1885 (1885a, 386–387), writing of the habits of this snake at Lake Xochimilco, near the City of Mexico, says, "The ends and shores of the piers are the resting places of innumerable water snakes, which can readily be observed from a canoe. * * * We caught a considerable number and found that they belong to the two species above named [*insigniarum* and *melanogaster*]. The *E. insigniarum* is the most active, sooner seeking the water, where it swims, keeping close to the shore, and remaining more or less in sight until it conceals itself in a hole. * * * The food of both of these species is the *Rana montezuma* Baird and another species allied to *Rana halecina*."

Again (1900, 1030) he writes: "On being disturbed the *E. macrostemma* plunges into the water, but does not go far beneath the surface, but takes refuge under the edge of a bank, or emerges in a new spot, so that it is difficult of capture. The columns that support the aqueduct that carries water from Chapultepec to the City of Mexico are covered with a dense vegetation, which is continuously watered by leaks in the venerable structure. On examining this vegetation at my height above the ground, I encountered in the thick of it a round eye. Exposure revealed first the head and then the body of a snake of this species, which found a congenial abode there."

Baker in 1895 (1895, 120–121), in speaking of a trip on Lake Patzcuaro says, "As we approached the island, a commotion was observed in the water, and a snake was seen to glide swiftly and noiselessly away. I quickly shot it; on picking it up we found it to be a large species of water snake (*E. insigniarum*). As we pushed our boat among the reeds bordering the island a great commotion was created in the water and a number of these snakes were seen to swim away."

From these accounts and the large numbers of specimens in different museums from the lakes of southern Mexico, there can be no doubt that *megalops* in southern Mexico not only thrives in a moist locality but is also quite aquatic in its habits. In contrast with these descrip-

tions is that of Doctor Coues (1875, 613), who states that according to his observations the species in Arizona is not "specially addicted to the water, frequenting dry herbage and bushes." This statement may justly be withheld as evidence, however, for, as will be shown later, the identity of the species which Coues referred to is doubtful. Since Cope's Duck Creek, New Mexico, specimen was also found in swampy ground in the vicinity of water, we may conclude that as far as our present knowledge goes *megalops* throughout its range prefers the vicinity of water. If this is true, while of more general distribution in the southern parts of its range (States of Mexico, Puebla, etc.), to the northward it probably becomes confined to those habitats in which water is to be found for the greater part of the year.

Range.—Much of the unity of this form may be accounted for by the character of the region which it inhabits. Geographically the Mexican plateau is a tableland lying at an elevation of 3,000 to 8,000 feet, and separated from the Gulf of Mexico on the east, and the Gulf of California and the Pacific Ocean on the west, by parallel mountain chains and a narrow strip of coastal plain. To the north it descends gently into the open basins of southern Arizona and southwestern New Mexico, being limited in its northward extension by the escarpment of the Colorado plateau, thus including the Proplateau region of southern United States (see Ruthven, 1907). Southward it extends to the isthmus of Tehauntepec, where it ends by the junction of the two parietal mountain ranges. This plateau has been built of the accumulated waste of the preexisting mountains, and volcanic discharges, the existing mountain peaks protruding through this mass, mainly in the higher parts of the plateau, as nunataks in an ice field (Heilprin, 1902, 774–775).

The climate of the plateau may be characterized in general as temperate (Heilprin, 1900, 777). The amount of precipitation is variable. In southern Mexico it is comparatively great, the rainy season lasting about six months, and the streams and lakes are perpetual. To the northward, however, owing to the influence of the eastern chain of the Sierra Madres, much of the moisture carried by the warm gulf winds is precipitated on the coastal plain, so that in their subsequent passage over the tableland they are desiccating winds. During the short rainy season of three months the flora of this arid region grows luxuriantly, but during the long dry season, in which the region is exposed to the glare of the tropical sun and the hot, dry winds, the vegetation becomes parched, and the streams and lakes partially or entirely dry. The aridity of this area increases to the northward, from San Luis Potosi northward being known as the Chihuahuan desert that grades into the Proplateau region of southwestern United States. This entire region, therefore (northern part of the Mexican plateau and the Proplateau regions), is arid. The

plains and lower mountain slopes are the home of the cactus, mesquite, yucca, creosote bush, and prickly pear, while the summits and canyons support a luxuriant growth of hardwoods or pines, according to the altitude.

Specimens have been examined from Tucson and Yuma, Arizona; Duck Creek, New Mexico; Lerdo, Durango and Coyotes, Durango; Guanajuato; Ocatlan, Jalisco; Lake Chalco, Chapultepec, City of Mexico, Chalco, Lake Xochilmilco, and Lerma, Mexico; Patzcuaro, Michoacan; Puebla, Puebla; "South Mountain or Micrado," Veracruz; Colonia Juarez, Jimenez, Chihuahua, San Andreas, and Minaco, Chihuahua. From these records the range of *megalops* may apparently be defined as the entire southern part of the Mexican plateau, extending northward along the western part of the plateau into southern Arizona and New Mexico. Owing to the fact that no real boundary of the tableland exists on the north, no geographical line of demarcation can be drawn here, and we find the species ranging into the open basins of southern Arizona and southwestern New Mexico, as far west as Yuma and to the north possibly to the escarpment of the Colorado plateau (the northernmost records being Fort Whipple, Arizona, and Duck Creek, New Mexico). Coues (1875, 615) recorded the species from Fort Whipple, Arizona, and Cope determined his specimens as this form. We are unable either to find these specimens or any others from this locality, so that, in view of the difficulty that has existed in properly distinguishing the garter-snakes of the southwest, this record should be held in abeyance until supported or denied by further evidence. Whether or not the form extends entirely across the northern part of the Mexican plateau, i. e., into the States of Coahuila and San Luis Potosi, remains to be discovered.

As we stated in the consideration of the environmental conditions, there are no geographic barriers in an east and west direction on the plateau, and *megalops* probably ranges over the entire area (Fig. 13).

Variation.—The uniformity of topography is clearly expressed in the homogeneity of scutellation, and the variation when properly determined elucidates many of the questions that have arisen over the division of the form. Bearing in mind that the males have as a rule a longer tail and more ventral and subcaudal plates than the females, and making allowance for the irregularities caused by a marked dominance of either in the averages, it will become evident that a great similarity in scutellation prevails all over the plateau from Puebla to Arizona. The scale rows, only in rare instances, vary from 21–19–17 by the presence or absence of a row; the ventrals vary from 152–173 with an average of about 160–165; the tail length is about .23 of the total length in the males and .21 in the females, and the number of labials oscillates about an average of 8 or 8.5. So

closely is this unity preserved over the entire extent of the range that it is only by carefully plotting the data from large series that any definite trend in the variations can be observed. When this is done, however, there is seen to be a distinct although slight decrease in scutellation and tail length toward the south.

FIG. 13.—DISTRIBUTION OF THAMNOPHIS MEGALOPS, AS INDICATED BY THE LOCALITY RECORDS.

From Arizona to Patzcuaro, Michoacan, no specimen has been examined with less than 21–19–17 scale rows, but 6 out of 45 specimens from the intervening region exhibit a tendency to have more than this number, in the presence of an extra row on either side for a varying distance, thus making the formula 21–23–21–19–17, the extra row never extending to the head. South of this locality but

one specimen has been examined with more than 21–19–17 rows, while about the City of Mexico and in Puebla a considerable proportion have the reduced formula of 19–21–19–17, and in three specimens from Veracruz one has 21–19–17, one 19–21–19–17, and the third 19–17, the smallest number for the species. It is also of interest to note here that the type of *flavilabris* which was from Veracruz (State) was said to have had 19 scale rows (Cope, 1866, 306). In the diagram that constitutes fig. 14 we have attempted to represent graphically this geographical variation in the number of scale rows.

The number of specimens at our disposal may perhaps seem too small upon which to base conclusions as to the variations in the number of scale rows, since it has often been affirmed that the number may vary a row or two in the same locality. Bearing in mind, however, the narrow limits of individual variation shown in our locality

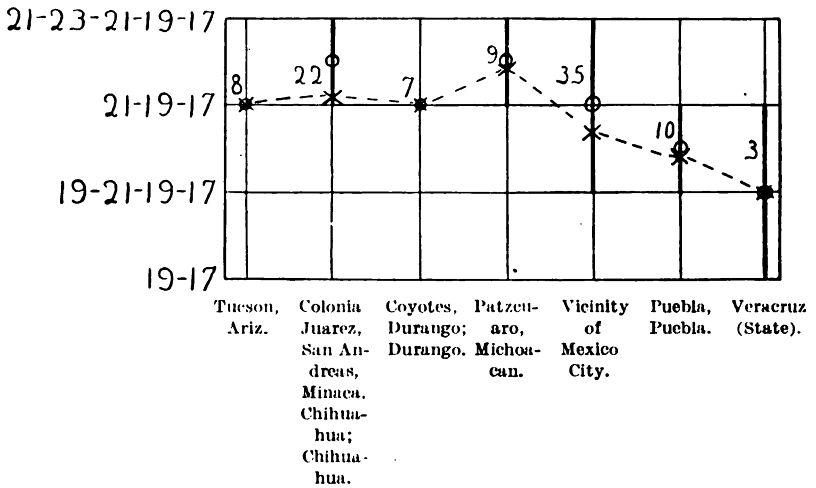


FIG. 14.—DIAGRAM SHOWING THE VARIATION IN THE DORSAL SCALE FORMULA IN THAMNOPHIS MEGALOPS.

records and indicated on our diagram, it may be clearly seen, even from this limited series, that, although slight, the decrease in the number of rows from Patzcuaro southward is entirely definite; while a similar reduction is indicated to the northward that may or may not be confirmed by larger series.

In the number of labials, as in the case of the dorsal rows, the question of sex may be ignored and the averages plotted directly, as has been done on the diagram, fig. 15. By comparing the tables it will be seen that although the arithmetical mean is quite constant, it is not uncommon to find 9 supralabials and 10 infralabials in Chihuahua; that no specimen north of Patzcuaro has been observed with less than 8, and that south of this locality 9 labials very seldom

occur. This variation is so slight that were it not for the considerable number of specimens upon which the averages have been based it might almost be ignored. However, it indicates, we believe, that there is a geographical variation in these plates, correlated with the decrease in the number of scale rows to the southward in Mexico. As

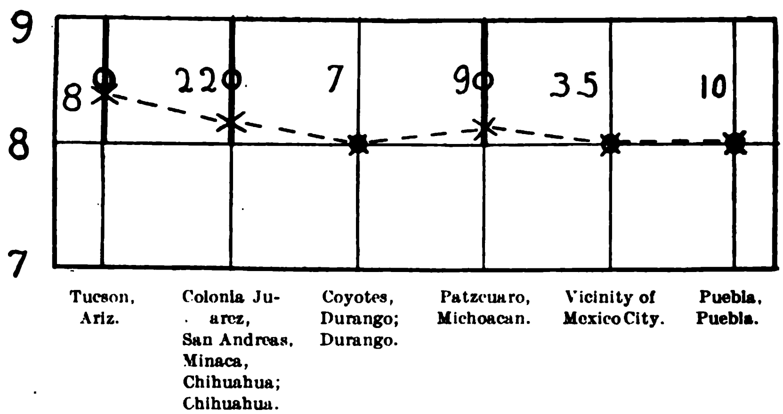


FIG. 15.—DIAGRAM SHOWING THE VARIATION IN THE NUMBER OF SUPRALABIALS IN THAMNOPHIS MEGALOPS.

we have before stated, the number of infralabial plates is more subject to individual variation and requires a larger series than is here available to furnish the mean number for each locality. Fig. 16 will show the amount of variation in the material examined.

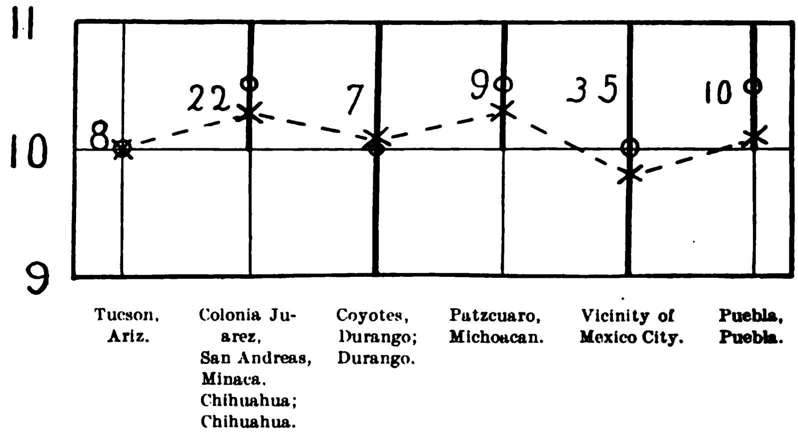


FIG. 16—DIAGRAM SHOWING THE VARIATION IN THE NUMBER OF INFRALABIALS IN THAMNOPHIS MEGALOPS.

In regard to the ventral scutes a similar variation is to be observed, but, as indicated above, the question of the sex of the specimens examined must be carefully noted. In general it may be said that there are in the males from 0 to 17 more plates than in the females,

so that if one sex greatly predominates in a locality it may throw the average either above or below that of another locality in which the opposite sex prevails, and thus obscure any geographical variation that may exist unless very pronounced. Even when each sex is plotted by itself geographical variation may be obscured by the individual variation owing to the small number of specimens. If, however, it can be shown that there is a similar geographic variation in both sexes and this cause of fluctuation is removed by combining the two sexes in approximately equal proportions, the increased amount of material should reduce the individual variation and also tend to decrease both the sexual and individual variations below the geographic.

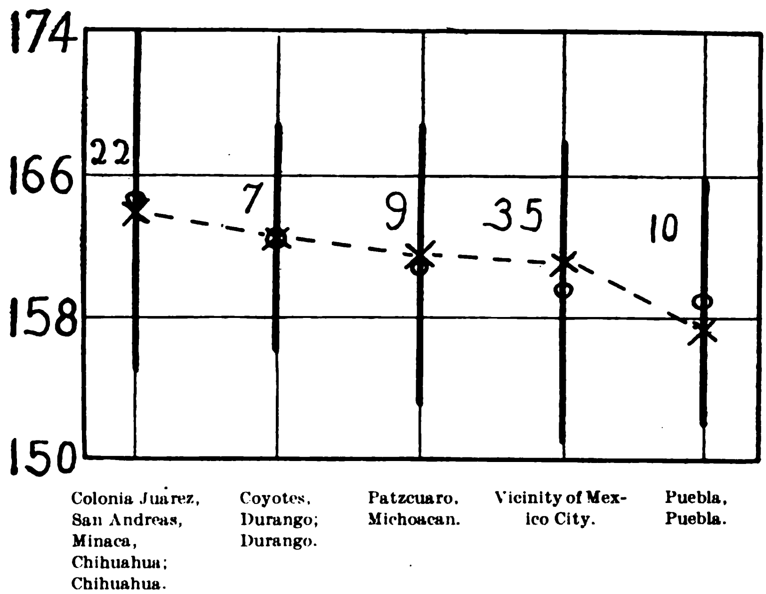


FIG. 17.—DIAGRAM SHOWING THE VARIATION IN THE NUMBER OF VENTRAL SCUTES IN THAMNOPHIS MEGALOPS.

When the range of variation in the two sexes is examined separately it is found that in Chihuahua the average number of gastrosteges in the males is 170 and in the females 165, a condition that seems to prevail southward nearly to Patzcuaro; at the City of Mexico, however, it is 165 in the males and 160 in the females, which indicates a reduction in gastrosteges in both sexes very similar to that of the scale rows. In diagram, fig. 17, I have plotted the locality variations in the number of these plates, and, although the sexes are only approximately equally represented in each series, I believe that the mean represents nearly the average number for each locality. If I am right in this it will be seen that there is a gradual decrease in the number of ventrals from Chihuahua and Patzcuaro toward Mexico City and

Puebla. While a similar reduction is indicated in my material from southern Arizona, the series upon which the computations are based is too small to be relied upon as representative.

The variation in the number of subcaudal plates is very similar to that of the ventral plates, but, owing to the much wider range of both sexual and individual variations, the geographic is even more liable to be obscured. In general the males may be said to have from none to about 10 urosteges more than the females, while the individual variation in the males may be as high as 12 and in the females 8.

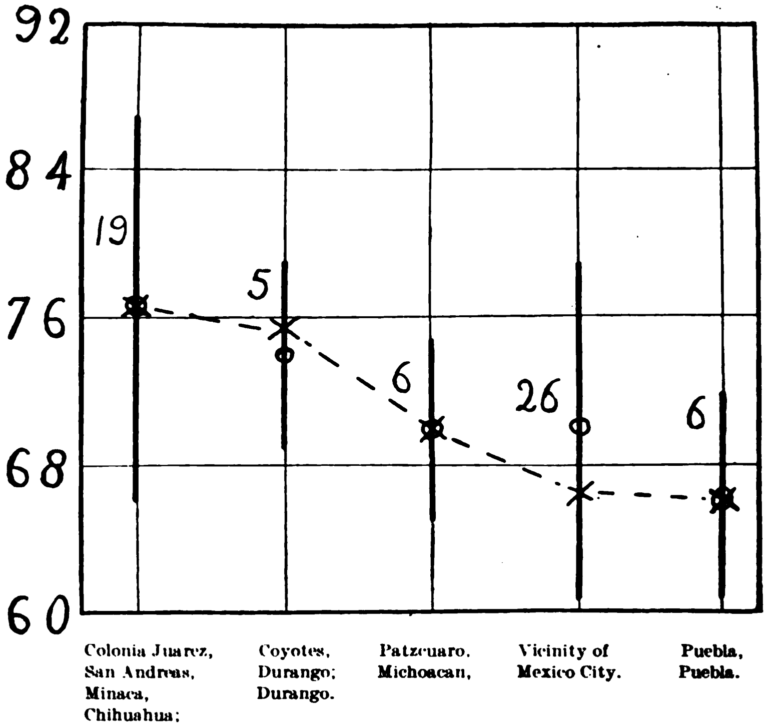


FIG. 18.—DIAGRAM SHOWING THE VARIATION IN THE NUMBER OF SUBCAUDAL SCUTES IN THAMNOPHIS MEGALOPS.

If we take only those localities from which seven or more specimens have been examined and examine the range of variation in the two sexes, there is shown that in Chihuahua and Durango the variation is from 75 to 87 (males) and 66 to 74 (females), while at the City of Mexico and Puebla it is 67 to 79 (males) and 61 to 67 (females), thus seeming to reveal a slight geographic variation. If males and females be combined in approximately equal numbers (fig. 18), an average of 76.3 is given for Chihuahua and 66.6 for Mexico City, which shows a slight decrease in harmony with the reduction in

scutellation, observed in the case of the scale rows, labials, and gastrosteges.

To summarize, then, there is exhibited in this form a decided tendency toward a decrease in the number of scale rows toward the southern part of the Mexican plateau, which is correlated with an apparent decrease in the number of labial, ventral, and subcaudal plates, and the locality records suggest that a similar reduction in the number of scale rows and ventrals exist in southern Arizona. In general I think that it can be safely affirmed that this reduction in scutellation to the southward is an evidence of dwarfing in this form, although it is impossible to prove it, of course, by measurements.

The proportionate tail length of specimens from the various localities has been examined and seems to be quite constant throughout the entire province, although an apparent geographic variation in this trait seems to be demonstrable. In Chihuahua it varies from .24 to .27 of the total length in the males, and in the females from .20 to .23, while about the cities of Mexico and Puebla it drops

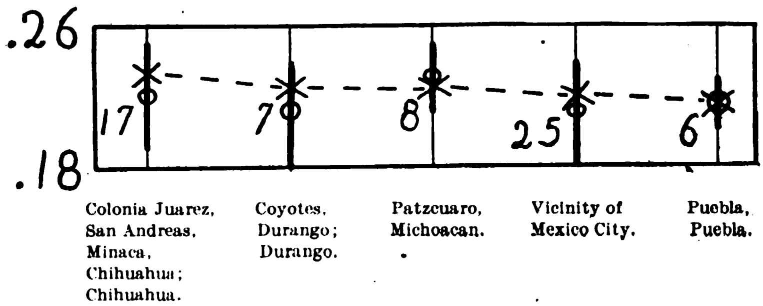


FIG. 19.—DIAGRAM SHOWING THE VARIATION IN THE PROPORTIONATE TAIL LENGTH IN THAMNOPHIS MEGALOPS.

to .20 to .22 (females) and .21 to .24 (males). When these are averaged in equal numbers and plotted (fig. 19), a slight decrease in the average length of the tail to the southward is evident. It is true that this reduction only amounts to .03; but it must be noted that the sexual and the individual variations have been excluded in large part, while a reduction approximately equal to the extremes of variation in either sex in one locality is still indicated. This decrease in the length of tail should not be confused with the decrease in the number of dorsal rows, labials, or gastrosteges, of which it is entirely independent, but it possibly explains in part the reduction in the number of subcaudals.

When the scutellation and tail length is plotted, the value of the divisions that have been made of the group on the basis of these characters is at once revealed. In 1860 Kennicott (1860, 330) described a specimen labeled "Tucson and Santa Magde" (No. 965, U.S.N.M.), collected by Major Emory and A. Schott, which had a

proportionate tail length of .25, giving it the name of *megalops*. Immediately following this he described a specimen from the City of Mexico, by Major Rich, giving no measurements, probably owing to the fact that the tail was broken. In 1885 Professor Cope (1885b, 173), in giving a synopsis of these forms, listed as *megalops* a specimen collected by himself on Duck Creek, New Mexico, which had a tail length of .26, and stated that *macrostemma* (*insigniarum*) may be distinguished by its shorter tail. In 1886 Cope (1886, 285) again listed as *megalops* ten specimens collected by Wilkinson at Chihuahua and stated that they did not differ from the Duck Creek specimen. In 1892 (1892, 646), in a key to the species of garter-snakes, he gives as the distinguishing differences that *megalops* has a tail length of less than one-third and more than one-fourth the total length, while in *macrostemma* it is more than one-fourth and not less than one-fifth, and on a subsequent page (651) lists three specimens of *macrostemma* (*insigniarum*) said to be from near Prescott, Arizona, thus extending the range of the latter to cover most of the region occupied by the former.

In 1901 Brown (1901, 22), in endeavoring to straighten out the American representatives of the group, found in five specimens from Mexico "the tail to be about one-fourth of the length, or longer than in most adult *megalops*, which reverses the proportions given by Cope." This threw the Arizona (*insigniarum*) specimens of Cope, which as Brown shows are from Tucson instead of Prescott, with *megalops*, which now becomes distinguished from *macrostemma* by the presence of a *shorter* tail; *macrostemma* is excluded from the United States, being replaced by *megalops* in southern New Mexico and Arizona.

The solution of this tangle is not hard to find if we take into consideration the sex of the specimens. In the first place, both Kennicott's type of *megalops* and Cope's Duck Creek specimens are males, the latter having a slightly longer tail than is usual, while the type of *macrostemma* (although not measured), and a number of other specimens from southern Mexico examined by Cope were females, while at least some of those that he measured (type of *insigniarum*) from the latter region, although males, have short tails, owing to the shortening that we have shown to take place toward the southern part of the range. Finally, Brown's Tucson specimens were females with characteristically short tails, which led him to reverse Cope's description.

As a matter of fact there is, as shown by our diagrams, a slight decrease in the tail length of the tail to the southward. But the amount is entirely too small upon which to distinguish a variety, much less a species, and the same thing holds true in regard to the scutellation. I have also stated that while a decrease in the scutellation in the southern parts of New Mexico and Arizona is

suggested, the tendency, if it exists, is not at all well defined. As regards the number of subcaudals and tail length in Arizona, the number of available specimens is far too small to settle this point, although the maximum number of subcaudal plates in the males is 86, while the tail length remains the same as in the Chihuahuan specimens. As regards the number of ventral scutes there is an apparent reduction, since the maximum number, even in the males, is but 165, while the minimum exhibited by the females is 153. It is to be observed, however, that although chiefly male records of the number of urosteges are to be had, this is due to the fact that it is the tails of the females in this lot that are mostly injured, and that the females actually predominate in the records, which explains the low number of ventrals. In respect to the labials the average at Tucson is 8.3, which is practically the same as in Chihuahua. The similarity in scutellation and tail length between Arizona and Chihuahua specimens is thus very close, and there is no reason to believe that a larger number of specimens will materially disturb it, so that it is impossible to divide the group here on this basis.

One more trait of the Mexican *megalops* remains for us to examine. Nearly the same difficulties have arisen over the attempt to distinguish different forms within this species on the basis of color as we have seen above to have arisen in the attempt to divide it on the basis of tail length. As is well established by the specimens, there is a considerable range of variation in color, but it remains to be seen whether this is individual, sexual, or geographic. In general the color may be defined as some shade of olive or brown, with three light stripes distinct or obscure. The lateral is on the third and fourth rows, anteriorly, posteriorly on the third only, on the second and third, or indistinct. The dorsal stripe covers a varying distance of from 1 to 3 scale rows on either side of the median dorsal one. The lateral spots are obscured on the scales in the dark specimens, but are distinct in the lighter ones, and when present occur on all but the keels of the involved scales. Of the variations of this general type four color phases may be noted:

First. The ground color is dull brownish olive, with the lateral spots visible on the edges of the involved scales, but not prominent, owing to the dark color. The lateral stripe is greenish olive, the dorsal stripe dull greenish yellow on the median and one-half of the adjacent rows, the edges not being well defined. The supralabials are dark greenish yellow, narrowly margined with black; the head olive brown and the parietal spots very small. The belly is bluish green, clouded with yellow anteriorly; the chin and throat also being yellow. (1279, Field Museum.)

Second. The ground color of the above type may become so dark as to appear nearly black, entirely obscuring the spots on the scales.

The lateral stripe is then dark and nearly obscured, the dorsal stripe represented only by dark yellow keels on the median rows of scales, the head black, parietal spots lacking, labials very dark brown, belly dark bluish, chin and throat yellow, and the supralabials brownish. (1097, Field Museum.)

Third. The ground color is dark yellow, the black spots on the skin also conspicuous on the scales, and covering all but the keels of those involved. The stripes are only indicated by the fact that the spots do not encroach as much upon the scales of certain rows. The dorsal stripe is wide, covering from three to five rows. The head is brownish yellow, parietal spots very small, labials dark yellow and narrowly margined with black, the belly, chin, and throat bright creamy yellow. (1098, Field Museum.)

Fourth. The ground color is light brownish olive; the lateral spots occur only on the edges of the scales, and the stripes are bright yellow and very distinct. The head is light brown, the parietal spots small, and the labials bright yellow, as are also the pre- and postoculars, and a postoral crescent. Distinct nuchal blotches. The belly is greenish yellow, and the chin and throat bright yellow. (1320, Field Museum.)

Kennicott's type of *macrostemma* corresponds in color to that which we have described as phase 1. In 1866 Professor Cope (1866, 306) described a new species which he called *flavilabris*, from two specimens sent to the Smithsonian Institution by Doctor Sartorius, which were labeled "Tableland or Southern Mountains of Mexico." Unfortunately the types are now lost, but according to the description there can be little doubt but that they were identical with color phase 4 as described above. There are at the present time three specimens in the U. S. National Museum (24993–4–5) which are labeled "South Mountains or Micrador Vera Cruz," and were collected by Doctor Sartorius. These are probably the specimens referred to by Cope (1866, 307), which, although he does not mention the resemblance, also seem to be referable to this phase.

In 1885 Cope (1885b, 172) again established a new species (*insigniarum*) on the basis of a specimen taken by himself at Chapultepec, Mexico, giving as its principal characteristics the absence of the dorsal stripe and occipital spots. It is impossible to distinguish the particular form he had in mind from this description, but fortunatėly both the type and cotype are available and correspond to our color phase No. 3; the cotype especially being a very good example of this style of coloration. In that paper (p. 173), in an attempt to give comparative diagnoses of the forms of this group, he distinguishes *insigniarum* from *flavilabris* by the absence of the dorsal stripe and occipital spots in the former. It will be seen, however, that this can not be done, since there is a dark phase (No. 2) which is similarily characterized

by an obscurity of these markings. In 1892 he apparently recognized this fact and the near relationships of these forms, as he describes them all as forms of *macrostemma*, evidently including *insigniarum* specimens with obscure markings both of the yellow (3) and black (2) phases, since he states that the type of *macrostemma* is intermediate in color between *insigniarum* and *flavilabris*. In 1900 he carried this farther and reduced *flavilabris* and *insigniarum* to the standing of varieties, but defined *macrostemma* (*insigniarum*) as being larger, *darker colored* and having the spots and bands indistinct and the parietal spots generally absent, as distinguished from *flavilabris* with its *brighter colored ground*, yellow labials, stripes, belly, and parietal spots. As we have shown in the description of the color phases, the ground color in the original *insigniarum* form is yellow, so that although Cope was justified in combining *insigniarum* and *macrostemma*, as all intermediate color phases occur, he has limited his description to include only the dark forms, phase 1 and 2, and placed the name *insigniarum* in the synonymy of *macrostemma*, but at the same time excluded the color phase to which it was originally given, putting these specimens with *flavilabris*. That this is actually the case is further shown by the fact that he subsequently labeled several specimens of the yellow phase (3) as *flavilabris*.

As a matter of fact it is absurd to attempt to distinguish subspecies on these color phases, and, indeed, impossible to do so and still observe geographic probability. If we ignore all questions of nomenclature and examine the color phases, it will be found that numbers 1, 2, and 3 may all occur in the same locality and intergrade perfectly, but seem to be quite distinct from phase 4, with its more distinct markings. If we examine the range of the specimens, however, we will find that the color phases 1, 2, and 3 are only represented in the southern part of Mexico, and that they include all of the specimens taken about the lakes in this region (Patzcuaro, Chalco, Xochimilco), while phase 4 is found to the north in Arizona, Chihuahua, Durango, and Guanajuato, and in Veracruz and Puebla. They can therefore hardly be classed as either individual or racial variations, and since they are not sexual, males and temales being found of either color, the suggestion arises at once that they may be due more or less to local environmental influences. This explanation is enforced by the fact that the specimens taken about the lakes Chalco and Patzcuaro (the forms with obscure markings) represent the aquatic forms whose habits have been described, while those in the more arid regions are the phase 4. This explanation must be taken with extreme caution, however, for in very few cases is there data with individual specimens. It is advanced principally to call attention to the need of detailed study on this point.

Enough has been said to establish the homogeneity of the form *megalops* throughout its range. This uniformity, which is in har-

mony with the absence of geographic barriers, is expressed in scutellation, tail length, and color. There are, however, variations both in scutellation and color. The color varieties are not individual or sexual, but seem to be partly at least associated with the dampness of the environments. The variations in scutellation and tail length are in the nature of a scarcely perceptible decrease toward the south. This reduction, as shown by our diagrams, is a general one, and involves the number of dorsal scale rows, ventral and subcaudal plates, and supralabials, being best marked in the case of the dorsal scale rows.

Affinities.—If we can base our faith upon the position of the lateral stripe there can be no doubt that *megalops* is a member of the *Radix* group, since there is never any doubt of its position being upon the third and fourth rows, for the greater part of the length. Although posteriorly this stripe seems to descend to the second and third rows, there has not been a single specimen examined or recorded in which it departed from the third and fourth rows anteriorly, even in those specimens with a reduced scutellation. It is in this respect sharply defined from all other forms on the plateau of Mexico, only to the northward (southern Arizona and New Mexico) coming in contact with a similar form.

MARCIANUS.[a]

Description.—We have seen that the arid basins of southern Arizona and New Mexico are inhabited by one species of the *Radix* group, the Mexican *megalops*. It is also the home of another characteristic and well marked form, known as *marcianus*, which is probably entitled to the distinction of being the most pallid form in the genus. This species was described by Baird and Girard in 1853 (1853, 36–37) from a specimen taken near Cache Creek in what is now Oklahoma, and is characterized by the presence of 21–19–17 dorsal rows of scales, 8 supralabials, about 155 ventral plates, about 68 subcaudals, and a tail length of about .23 in the males and .22 in the females. The lateral stripe is very light, on the third row of scales only anteriorly, posteriorly being upon the second and third rows. The general ground color is light brownish yellow, which is in marked contrast to the black markings. In view of the fact that it has for years been considered a subspecies of *elegans*, it may appear strange to some herpetologists that this species should be considered a member of the *Radix* group. We hope, however, to be able to justify our position by showing that there is in reality less difficulty in referring it here than to the other groups in the genus.

[a] *Thamnophis marcianus* (Baird and Girard), Catalogue of North American Reptiles, 1853, pp. 36–37. Includes the *Eutænia elegans marciana* of later writers, and *E. nigrolateris* Brown (1889, pp. 421–422).

Habits and habitat relations.—Rarely is it possible to obtain a sufficient number of records to map in detail the range of any form, but if we know its preferred habitat we can, in doubtful regions, determine more or less accurately the probable extent of its range by the limits of the environmental conditions with which it is usually associated. In the present case such data would be of great value, but unfortunately, as far as we have been able to find, there is practically nothing recorded on the habits of *marcianus*, with the exception of the general conditions of the region it inhabits. I have observed elsewhere (Ruthven, 1907, 589) that it is occasionally at least found in the vicinity of streams, which is in harmony with the known habits of the other arid region forms in the genus (fig. 20).

FIG. 20.—SANTA CRUZ RIVER AT TUCSON, ARIZONA. THAMNOPHIS MARCIANUS HAS BEEN FOUND HERE.

Range.—The region inhabited by *marcianus* includes the Proplateau region of southern Arizona, New Mexico, and Texas, the central part of the latter State, and northern Mexico. We have already briefly discussed the geographic and climatic conditions of the Proplateau region, so there remains to be considered only the environmental conditions in the Texas portion of the range of this form. This region may for convenience be divided into two physiographic regions; the prairie-plains region, situated roughly to the east of the Pecos River, north of the thirtieth parallel and west of the ninety-eighth meridian, and the Rio Grande plain, which occupies the triangular area between the prairie-plains, Rio Grande River, and ninety-eighth

meridian. As here defined, the prairie-plains region includes the "Central Province" of Hill and the strip of prairie that extends southward from Austin to the Rio Grande plain. The Rio Grande plain, as we use the term, is synonymous with the "Lower Rio Grande Country" of Hill (see fig. 21).

To the east of the East Front Ranges, the western Texas region descends from the high plateaus bordering the Rocky Mountains in northern New Mexico by a series of broad plains arranged in the form of a great stair (as described by Hill) to the Gulf of Mexico. The higher part of this area constitutes part of the plateau region of western United States and is bounded on the south and east by a

FIG. 21—THE NATURAL DIVISIONS (ENVIRONMENTAL COMPLEXES) OF THE GREATER TEXAS REGION.

line running from Del Rio to Austin and from here west and north to Oklahoma. To the eastward the plateaus grade down into the prairie region, which forms a broad band across central Texas and extends to the northward beyond the State.

The climatic conditions of these regions are well illustrated by the character of the vegetation. The Trans-Pecos region is a part of the Proplateau region of southern Arizona and New Mexico, and the conditions are very similar to those in the latter States. The rainfall is mostly below 10 inches, and the evaporation is high, which with the scanty rainfall prevents the occurrenee of arboreal vegeta-

tion, except on the higher summits. The flora of the plains and the slopes below the timber zones consists of such forms as the sotol, ocotillo, creosote-bush, mesquite, and a host of cactuses.

To the east of the East Front Ranges the climate becomes progressively more moist than that of the Proplateau region, although the rainfall continues below 30 inches to the ninety-eighth meridian. On the sandy plains of the lower Rio Grande, with its dense growths of chaparral and intervening prairies, the conditions are still very arid, owing to the low humidity and small rainfall, but to the eastward the grasses become more mesophytic and grade into the eastern forests near the 98th meridian. To the northward the forest margin is bordered on the west by the mesophytic grass associations of the prairies that rise to the westward to the solid buffalo grass formation of the high plains.

The ninety-eighth meridian, as has been pointed out by Hill (1900) and in more detail by Bray (1901 and 1904), and Bailey (1905), marks in a general way the boundary between the mesophytic forest of southeastern United States and the great grass country of Texas. This doubtless marks equally well the dividing line between the fauna of these two areas. As Bailey has shown, it marks the eastern limit of the mesquite, Texan woodpecker, and Texas rattlesnake.

Owing to the extreme paucity of records, it is impossible to draw the geographic boundaries of *marcianus*, except in a very general way. The range has been defined by Cope (1892, 656) as "restricted to the valley of the Rio Grande from Colorado to its mouth, extending eastward into Texas as far as the Concho and Nueces rivers," but as specimens have been taken in Arizona, the range as given by Brown (1901, 24), "Central Texas to western Arizona" is more nearly correct. But little importance can be placed in locality records for this form until the specimens have been examined. In 1875, Yarrow (1875, 573), in writing of this form, remarked that the last specimens of *vagrans* (*elegans*) seen were at Taos, New Mexico, on the north side of the Picoris Mountains, while on the south side of these mountains *marcianus* was said to occur for the first time, and specimens were listed from "San Ildefonso, New Mexico," "Abiquiu, New Mexico" (3), "Taos, New Mexico," and "Pueblo, Colorado" (2). Unfortunately only field numbers are given for these specimens, so that they cannot be located with certainty, but the only specimens in the U. S. National Museum from these localities bearing the date and collectors recorded by Yarrow are three specimens of *elegans* from Abiquiu (No. 8728), one specimen of *elegans* labeled "New Mexico" (No. 8421), and two specimens of *radix* from Pueblo (No. 8581). The particular specimens from San Ildefonso listed by Yarrow as *marcianus* cannot be determined with certainty, as there are a number of specimens in the U. S. National Museum bearing the same

date and locality. There are, however, two specimens from San Ildefonso (8416–8417) of *eques* that are labeled *marcianus*, while it is to be noted that the only specimens from Taos in the Museum are *elegans*.

With these gross errors confronting us in the literature, it is evident that we can trust neither the general ranges given nor the detailed locality records. I may be excused, therefore, for confining my discussion of the range of this group principally to the specimens that I have examined. Fortunately the doubtful localities are rare, for I have examined the specimens upon which most of the records have been based. I have examined specimens with defi-

FIG. 22.—DISTRIBUTION OF THAMNOPHIS MARCIANUS, AS INDICATED BY THE LOCALITY RECORDS.

nite locality records as follows: Fort Yuma, California; White Horse Springs, and Fort Supply, Oklahoma; Matamoras and Charco Escondido, Tamaulipas, and Ojo del Diable, Chihuahua, Mexico; Brownsville, San Diego, Point Isabelle, Reutersville, Cameron County, San Antonio, Indianola, Eagle Pass, Pecos, San Angelo, Helotes, Jeff Davis County, "South of Clarendon," Kerrville, Texas; Tucson, Arizona; "Red River, Arkansas."

When these localities are plotted on a map (fig. 22) the distribution of the form is seen to be more extensive than has been generally stated. In the Proplateau region it is known from as far west as Yuma,

Arizona, but, as has been elsewhere stated (Ruthven, 1907, 589), since only three[a] specimens have been recorded from here and this is the only record for the Sonoran desert region in Arizona, they should not be taken as establishing the occurrence of the form so far to the westward, for the locality may not be an exact one. Its northern and southern limits in this State can only be conjectured. The single specimen in the U. S. National Museum labeled "Ojo del Diable, Chihuahua," is the southernmost record for the Proplateau region. Aside from the Yuma records, which consist of one specimen in the Academy of Natural Sciences of Philadelphia and two in the U. S. National Museum, all collected by Major Thomas, no other specimens are known to me from southern Arizona, except three in the Academy of Natural Sciences of Philadelphia, two in the National Museum, and one in the American Museum, all from Tucson. It is probable, however, that it ranges north to the Colorado plateau, although no specimens have been taken at Fort Whipple, where considerable collecting has been done. It is highly probable that it does not range north of this point.

For New Mexico there are no authentic records. As we have seen above, Yarrow's specimens are to be referred to *elegans*, *eques*, and *radix*. Cope (1883, 12) records a specimen taken by Frank Snow at Socorro, but I have been unable to verify this record. Without doubt *marcianus* occurs in the southern part of this State, but its northern limit is a debatable point, for although the high plateau, as in Arizona, may exclude it from all but the extreme southern part, on either side of the Rio Grande, there seems no good reason why it should not occur up the valley of this river at least as far north as Las Cruces.

In the Trans-Pecos region of Texas *marcianus* has been recorded from the Davis Mountains, Jeff Davis County, Paisano, and Boquillas, all localities south of the high plateaus. East of the East Front Ranges the records indicate that it occurs throughout the prairie region of central Texas, and the Rio Grande plain as far south as Charco Escondido, Tamaulipas, north to Fort Supply, Oklahoma, and westward to an undetermined distance on the plains. Clarendon, Pecos, and San Angelo are the most western records for this region, and it will be noticed that these localities mark approximately the eastern margin of the Staked Plains. Whether this indicates the actual western limit of the form in this region, or the lack of specimens from more western localities, can not of course be determined. As in the Proplateau region, however, it is significant that its chief distribution in Texas is confined to the lower altitudes, so that it would not be surprising to find that its western range is limited by the increasing altitude of the high plateau, the Pecos records possibly indicating that it pushes to some extent up

[a] Erroneously given as two in the paper mentioned.

the river valleys. The eastern limit of its known range is represented by the Victoria, San Antonio, and Austin records, and is approximately the 98th meridian, which, as we have seen, marks the boundary between the prairie type of biota of central Texas and the forests of southeastern United States. The most northern record is Fort Supply, Oklahoma (see p. 69). The range of this form then may be defined as the arid deserts of northern Mexico, southeastern Arizona, southern New Mexico, and southwestern Texas, the arid plains about the lower part of the Rio Grande, and the prairie region of central Texas.

Variation.—The individuality of *marcianus* is so pronounced that it stands out in strong relief from the other forms in the region which it occupies, and makes the question of its affinities a very puzzling one. At the same time it is a very homogenous form and apparently varies but little either geographically or individually, as shown by the fact that but one other variety (*nigrolateris*, Brown, 1889), based on an anomalous specimen, has been made from it, a form since dropped.

Any discussion of the variations of *marcianus* must be made with great caution in consequence of the inadequate number of specimens available. Although the material in the American, Field, and U. S. National Museums, and the Philadelphia Academy of Natural Sciences have been examined, besides a number of specimens from private collectors, it has been impossible to obtain more than 60 individuals of this form. Fortunately these appear to be scattered over most of the range of the species, and this with the apparent lack of marked individual variation makes it possible, even with but a few specimens from the different localities, to examine the geographic variation. In every specimen examined from Tucson, Arizona, to Oklahoma, the scale rows are 21–19–17.

The supralabials are more variable; at Tucson they are constantly 8 in 5 specimens; at San Antonio, 8 and 9; in Cameron County they are 8 in the great majority of cases, occasionally 7, and in one case 9 on one side, with an average of 7.9; in Oklahoma 8. Evidently from the material at hand it is impossible to say that there is any geographic variation in this character. As regards the ventral plates, the females have 151 to 156, in the specimens labeled "Yuma, Arizona," and the males 157 to 162, with an average (all specimens) of 155.6; at Tucson two males have 160 and three females 156–159, average 158.4. At San Antonio a female has 149 and a male 157; while in Cameron County the range in variations of both males and females are lowered, in only two cases reaching 160 and falling as low as 144, the average being 151. At White Horse Springs, Oklahoma, a male has 157 and a female 155. These figures seem to indicate a slightly larger number of gastrosteges in

Arizona and a decrease in the Rio Grande Plain, but, while the average for Cameron County probably approximately indicates the actual conditions, the other averages are based on far too small a number of specimens to be reliable. The most striking fact shown by these figures is the uniformity in the number of ventral plates throughout the range of the group, for although enough records are not at hand to reveal any slight trends of variation if they are present, enough have been secured to indicate beyond question that such variations, if they actually exist, must be small, as the averages from the different localities differ less than the amount of individual variation in any set of records. The evidence of the subcaudal plates is especially unsatisfactory, for it is evident that not nearly enough records have been obtained to determine even approximately the range of sexual variation. The specimens labeled "Yuma" vary from 62 to 71, average 66.6. At Tucson the average is 68.6; in Cameron County the average is 68.6, while at White Horse Springs a male has 71. Here again we find that the averages when males and females are combined falls between 66 and 69, a difference of but 4 scutes and one that could easily be due to the predominance of either sex in the averages.

As in the case of the subcaudals, it is impossible from the material to determine the limits of sexual variation in the tail length, yet an examination of the measurements indicates that the males, as a rule, vary from .22 to .26, the general length being between .23 and .24. The females seldom vary more than two points about .21, the range being from .19 to .22.

It is not to be inferred from the above discussion that there is no geographic variation in the form, for it is possible that when a large enough number of specimens have been examined to establish the limits of sexual variation it will be found that there is some variation in different parts of the range. But nevertheless the evidence now available indicates that if such a variation is present it is small, for even this small amount of material, subject as it is to irregularities caused by individual and sexual variation, demonstrates unquestionably a close uniformity in scutellation and tail length throughout the entire range.

In color this uniformity is even more strongly enforced, and can be no more plainly expressed than by the statement that, owing to the constancy of coloration throughout the extent of its range, no variations have been considered of specific or subspecific value. The ground color is usually light brownish yellow above, with three rows of alternating black spots; the first row on the first, second, and occasionally part of the third rows of scales, the other two rows alternating between the lateral and dorsal stripe, on the skin and all but the keels

of the involved scales. The stripes are very light yellow; the lateral stripe on the third row only anteriorly, and posteriorly on the second and third; the dorsal on the median and about one-half of the adjacent rows encroached on to the median row by the upper row of spots. Large nuchal blotches and a distinct postoral crescent. Head dark olive; first, second, third, seventh, and eighth supralabials olivaceous, the fourth, fifth, and sixth, with the preoculars and second and third postoculars, being light yellow. The third, fourth, fifth, and sixth supralabials margined with black. Belly light yellowish ash. In older specimens the ground color becomes darker, and the spots seem to retreat from the scales, although still distinct on the skin. The spots below the lateral stripe also become indefinite, but the stripes themselves retain their position. This variation, however, is apparently due to age, as we have said, and as far as we have been able to see there is no marked geographic differences in color.

Affinities.—Considered in the totality of its characters, *marcianus* stands out in decided contrast to the other forms in this region, and, as we have stated before, this individuality has in great part delivered it from the confusion that has resulted in the efforts to classify many of the other forms. The attempts that have been made to determine the relationships of *marcianus* have, however, led to several extraordinary results. It was described in 1853 by Baird and Girard (1853, 36–37) as a distinct species and no attempt was made to establish its affinities for thirty years. In 1883 Garman (1883, 25 and 138) included it as a subspecies of *sirtalis*, which, however, means little as regards genetic relationships, for we find this writer including as varieties under this species such divergent forms as *radix*, *elegans*, and *sirtalis*. Cope in 1892 (1892, 656) reduced it to the rank of a variety in the *Elegans* group, on the basis of the position of the lateral stripe on the second and third rows, and the possession of 21 scale rows and 8 upper labials, thus allying it to *elegans* and *hammondi*. This arrangement was followed by Brown in 1901 in his review of the genus (1901), but in 1904 (1904, 470) he changed his mind and derived it directly from *parietalis*, with no explanation as to his reasons for so doing. These dispositions of the form are unsatisfactory, to say the least.

It will be observed that the placing of *marcianus* in the *Elegans* group rested upon the assumptions that the lateral stripe is to be considered on the second and third rows of scales, which is far from established, and that racial affinities are indicated by similarity in the number of scale rows. The latter, as we have seen, is also far from being the case, and we are thus freed from the necessity of accepting any of the solutions of the problem that have been based on these grounds. We must search for similarities with other forms

in the light of our knowledge of the method of variation and of geographic probability.

The only character, so far as I can see, that would justify an attempt to derive this form from *parietalis* and relate it to *eques* is the pallid color. In general the ground color is nearly the same as in *eques*, while the paleness of the labials and stripes, and the similarity in the arrangement of black markings, is so close as to result in frequent confusion. Color, as we have seen, is the least important of our criteria, but it is worthy of note that in spite of the pallidness in *eques* the lateral stripe is always distinctly on the second and third rows throughout the entire length (instead of on the third row only), even in the region in which it occurs with *marcianus*. In scutellation there is very little resemblance between *marcianus* and *parietalis* or *eques*. The latter in Texas has mostly 8 supralabials and always 19–17 scale rows, and *parietalis* has usually 7 supralabials and always 19–17 scale rows. According to our observations on the variation in the number of scale rows, *marcianus* could have been derived from either *parietalis* or *eques* by an increase in the number of scales, but the further difficulty presents itself that both of the latter species (especially *eques*) overlap the range of *marcianus* considerably without effecting the purity of the types, and the only way by which they can be considered akin is to invoke the aid of some form of isolation (ecological or physiological), which the evidence of similarity does not call for. The difficulty of adopting such an explanation would be less if there were any signs of intergradations in these forms; but, as it is, *marcianus* has constantly 21–19–17 rows and *eques* and *parietalis* 19–17. Its relation to the *Elegans* group is not, however, so easily disposed of.

In the possession of 21–19–17 scale rows and 8 labials *marcianus* agrees closely with *hammondi* and *elegans*, and while the number of ventral and subcaudal plates is normally less and the tail shorter, the inference might well be drawn that the similarity is an expression of relationship. Nor does the lateral stripe confute this, for it is the general pallidness of the ground color that apparently makes the stripe indistinct except upon the third row. Geographically also it seems, at the first glance, as if this relationship was confirmed, for the range of *hammondi*, *elegans*, and *marcianus* seem to be exactly contiguous, and do not overlap. There are certain facts, however, that confute the evidence furnished by the similarity in scutellation. First and foremost, is the lateral stripe to be considered as being upon the second and third rows? Secondly, *hammondi* is markedly distinct in color from *marcianus* even in the regions where they approach each other, and this distinctness is supported by the general topography of the body, as expressed in a longer, narrower head, increased number of urosteges, etc., and the presence of two

preoculars. Very evidently it seems to us that if we grant a relationship between these forms it must be a distant one, for there can be no question as to their distinctness at present.

As regards *elegans*, the geographic probabilities may also be conceived as favoring a close relationship, for it seems very evident that in Arizona, New Mexico, and Texas, where the range of the two forms come together, *elegans* is restricted to the plateaus and *marcianus* from them, and the differences between the two forms may be explained by this separation of their respective ranges and as the result of the different conditions to which they are exposed. Thus *elegans*, even in the most southern localities from which it is known, San Ildefonso, New Mexico, presents so often a scale formula of 19–21–19–17 as to indicate plainly a tendency toward a reduction in scutellation, which may possibly be correlated with the higher altitude of its habitat, while in coloration it resembles so closely dark specimens of *marcianus* as to make it difficult at times to refer specimens to the proper form. Furthermore, the generally light color of *marcianus*, as I have shown, may be correlated with the aridity of its habitat. What, then, is the objection to this attractive view? If we take for granted that *elegans* is a dwarfed form of a stock that possessed a larger number of scale rows, it seems to us that we have reason to expect that correlated with the decrease in the number of scale rows there at least will not be an increase in the number of ventral plates, although the tail length and urosteges may vary independently, as we have seen. If the reduction in the different series of scales on the body is correlated, as seems to be the case, then *elegans* has apparently been derived from some stock with a larger scutellation than *marcianus*, since it has a decidedly larger number of ventral plates. This problem will be taken up again when the *Elegans* group is considered, but it seems to me, although the material is as yet much too meager to warrant any decided opinion, that the neighboring species of the *Elegans* group all give evidence of being derived from a different source than *marcianus*, and the opposite.

If this point be granted, I have now excluded *marcianus* from all except the *Radix* group, and it remains for me to examine its relations to the other forms of this group. The fact that the first row of spots covers the first and second rows anteriorly seems to furnish some evidence that the stripe is to be considered on the third and fourth rows. Still, this is, of course, not conclusive, and the lateral stripe must still be considered noncommital, although the fact that it occurs on the second and third rows posteriorly is not an insurmountable objection, as it also has this position in *megalops*, in which it is anteriorly upon the third and fourth rows. The number of labials is much the same in both *marcianus* and *megalops*, as is also the tail length. On the

other hand, the number of dorsal scale rows, subcaudals, and ventrals are apparently less. Thus there are no serious objections to deriving *marcianus* from *megalops* on structural grounds (the geographic probilities will be considered later), but still there is no satisfactory proof that such a relationship actually exists, and we must look elsewhere for evidence of its relation to the *Radix* group.

On the north *marcianus* meets *radix*, and when the scutellation of these forms is examined it is seen that there is no great break between the forms in this regard. The number of scale rows and labials are the same near the common boundary, and, notwithstanding the fact that *marcianus* has a smaller range of variation in the number of ventrals (157–163) as compared to *radix*, 159–172, in the same general region, the averages are very close, while the tail length and number of subcaudals are approximately the same. In spite of the fact that the color of *radix* is usually darker, the general pattern is very similar to that of *marcianus*. Indeed, in western specimens of *radix* the ground color becomes quite light, so that in the case of two specimens from Oklahoma, in the possession of the Field Museum (Nos. 630, 631), it is impossible to tell whether they are to be referred to *radix* or *marcianus*. In these specimens the color is dark brownish yellow, the first and second rows light ash. The spots are in three very distinct, alternating rows on the skin and all of the involved scales; the first row being on the first and second rows, the other two between the stripes. The lateral stripe is distinct, narrow, and anteriorly on the third and part of the fourth rows, posteriorly on the second and third. Anteriorly the spots tend to fuse into large blotches. Eye rather small. Head dark olive. The first, second, seventh, and eighth supralabials are more olive, the third to sixth, inclusive, being light yellow; all are margined with black, the fourth, fifth, and sixth the heaviest. This coloration is so like that which exists generally in *marcianus* as to make it evident that these specimens are closer to this form than any other. The points that indicate an affinity with *radix* are the fact that the first and second rows of scales differ in color from the lateral stripe and are covered by the first row of spots, and that the lateral stripe seems to be partly on the fourth row. If I am right in considering that these specimens from Oklahoma indicate that *marcianus* and *radix* are directly related, the lateral stripe in the former must be considered as belonging on the third and fourth rows of scales, which throws the form with the *Radix* group.

Whether *marcianus* and *radix* intergrade at the present time along their common boundary, or not, is not a question to be decided on the basis of two specimens, but, be this as it may, it must, we think, be conceded that there is such a very close similarity in scutellation and color between the two forms as to warrant the conclusion that they are directly related, while if we consider the lateral stripe in the former

as a modification of the third and fourth row position, there is little difficulty in placing *marcianus* in this group. A prime difficulty which presents itself is the necessity of accounting for the fact that it overlaps in part the range of *megalops*, with which, if we can trust the evidence of the lateral stripe, it must be closely related. Before this objection can be considered, it will be necessary to obtain much more information on the distribution of both *marcianus* and *megalops* in southern Arizona, for, as has been shown, but very few records of either form are at hand from this region, while some of those that are available are, to say the least, open to question. However, it must be admitted that *marcianus* undoubtedly occurs at Tucson, while *megalops* exists in southern New Mexico (Duck Creek), so that the forms unquestionably overlap. Still, it seems to us that the similarities are close enough to warrant the working hypothesis that *marcianus* is an offshoot of *megalops* that pushed across the deserts of northeastern Mexico and into the Trans-Pecos and western Texas region, and here obtained its individuality, so that as it moved eastward it found its range limited by the transition line between the prairies and the forest, while in its subsequent westward movement into the range of the parent stock (*megalops*) its differentiation in structure or habits was sufficient to keep the two from interbreeding. To the northward, in Arizona and New Mexico, its range was limited (except in the valleys) by the high plateaus, but in Texas the extension of the semiarid prairie-plains furnished a highway to the northward, along which it spread, becoming (in Oklahoma and southern Kansas) reduced in the number of scale rows and darker in color to constitute the form now known as *radix*.

This is a bold hypothesis to be made on the basis of such a small number of specimens, but, granting the fact that more observations may overthrow it entirely, it seems to me, in the light of our present knowledge, to be the most satisfactory explanation for the origin of the form. At all events, if it arouses discussion and stimulates further investigation, it will have served its purpose.

RADIX.[a]

Description.—I have already noted that along its northern boundary, in Oklahoma, *marcianus* approaches another form, *radix*, with which it is apparently closely related. However this may be, the specimens now at hand indicate that throughout most of its range *radix* is a distinct and well-defined form, which it is comparatively easy to distinguish.

---

[a] *Thamnophis radix* (BAIRD and GIRARD), Catalogue of North American Reptiles, 1853, p. 34. Includes *Eutaenia haydeni* KENNICOTT, *E. radix twiningi* COUES and ow, and *E. radix melanotaenia* COPE.

Fortunately in this form no doubt attaches to the position of the lateral stripe, as it is always distinctly present on the third and fourth rows anteriorly, and generally on the third only posteriorly after the fourth is dropped. The scutellation may be generally described as follows: 21–19–17, 19–21–19–17, or 19–17 dorsal scale rows; 7 (8) supralabials; 142 to 176 ventral plates, and 57 to 87 subcaudals. There is so much variation, however, as we shall see later, that this general statement has but little value. The tail length is quite constantly about .23 to .26 in the males and .20 to .23 in the females. The ground color is some shade of brown, with the usual three stripes, the laterals greenish or bluish, and the dorsal yellow, frequently inclining to orange. The lateral spots, as in *megalops* and *marcianus*, are in three distinct rows, except when the ground color is so dark as to obscure them.

Habits and habitat relations.—*Radix* probably enjoys the distinction of having furnished us with as much or more information concerning its habits than any other form in the genus, and yet it will be very apparent from the following summary that our knowledge is still very incomplete. Taylor (1892, 324), in writing of its habits in Nebraska, says that *radix* "in food habits agrees with specimens of *E. sirtalis* var. *parietalis* of the same size. Earthworms and insect larvæ seem to constitute the bulk of their food." Elsewhere the food of large individuals of *parietalis* is said to be the leopard frog, while specimens "not exceeding two and one-half feet in length almost always contain within their stomachs specimens of the common earthworm."

In 1882 Dr. Henry Brous, in the American Naturalist (1882, 564), recorded the following notes on the habits of this snake:

Several of the summers I passed upon the plains were preceded by rainy springs, swelling to unusual height the small streams which become inhabited by small fishes. During the drought of hot summers the receding waters left the fishes in shallow pools within creek beds, an easy prey to their numerous enemies.

The midday heat caused numbers of snakes to seek shelter from the sun, and the garter-snake (*Eutaenia radix*) in particular chose water at this time. Here the fishes, unable to escape or find deep cool water, were unwilling cotenants with the snakes. The latter are fond of fish, and would devour great numbers of the smaller ones, chasing them from one part of the shallow pool to the other. When the fishes were in water too shallow to swim in, or were struggling upon the sand, they would be seized by the snakes, who would feed upon them until unable to contain more. The snakes would follow the fish through the water, diving and remaining submerged some time. I did not observe them swallow air. (See Am. Nat., Jan., 1880.) Snakes evince more than ordinary energy and sagacity in capturing fish; half a dozen will congregate within a small pool, all acting in concert.

Mr. J. L. Wortman, who had charge of a scientific party last year, informs me that while fishing one day he caught numbers of chub (*Cyprinidæ*) and, throwing them on the mud, was surprised to see but few remained. While quietly continuing to replace those so singularly missing, he observed a garter-snake seize and swallow one of the fish 6 inches in length. There were two of these snakes reaping the benefit of Mr.

Wortman's skill. Upon opening the snakes one was found to contain six fishes. The headwaters of the Smoky Hill and Big Horn rivers abound in this aquatic *Eutaenia radix*.

Doctor Coues (1878, 278) has also observed the habits of *radix* in North Dakota and Montana:

In the more fertile portions of the Red River Valley itself, throughout the Red River region, from Pembina to where the Coteau de Missouri crosses the line, it is the characteristic Ophidian, the principal and almost only representative of its order, outnumbering all the others put together. * * *

In the more fertile portions of the Red River Valley itself this snake may be found almost anywhere in the brush and herbage. Out on the drier prairie beyond it is chiefly confined to the pools and streams, or their immediate vicinity. Numbers are found basking together on the muddy borders of the sloughs or among the masses of aquatic vegetation where they find ample subsistence during the summer months in

FIG. 23.—HABITAT OF THAMNOPHIS RADIX AND T. SIRTALIS PARIETALIS. SLOUGH (OUTLET TO ELBOW LAKE), CLAY COUNTY, IOWA. THE MARGIN OF THESE GRASSY SWAMPS IS APPARENTLY THE MOST FAVORABLE HABITAT FOR T. RADIX IN THE PRAIRIE-PLAINS REGION, AND WITH IT IS FOUND ASSOCIATED T. SIRTALIS PARIETALIS.

tadpoles, young frogs, and various water insects. They are themselves preyed upon by hawks, especially the Marsh Harrier (*Circus cyaneris hudsonius*) and Swainson's Buzzard (*Buteo swainsoni*). They are less active than some of the slender species, are readily caught, and when captured make little or no resistance. Only the largest individuals assume for the moment a defensive attitude and attempt to bite; most may be at once handled with impunity.

My own observations on the habits of *radix* in northwestern Iowa agree in the main with those of Doctor Coues. The topography of this region is characteristically glacial, and consists principally of moraines with intervening lakes, ponds, or swamps, according to the depth of the depressions. The swamps, locally known as "sloughs" (fig. 23), are characteristic of the prairie region. The

water is not deep enough, except in occasional pools, to prohibit a rank growth of grasses and sedges, which grow for the most part in clumps on compact elevations formed of decaying roots and rhizomes. Between these hummocks the substratum is soft, plastic mud, with usually a varying amount of water over the surface. This habitat is a very favorable one for frogs, and all stages of the leopard frog are abundant, from the tadpoles in the pools to the large adults hopping about in the grass. The margin of these swamps is also pre-eminently the preferred habitat of *radix,* and the collector can at any time during the summer months pick up several dozen specimens of various sizes in a short time at almost any of these places. There can be no question as to at least one feature of their food in this habitat, for it is a common experience while walking about the margins of a slough to hear the hoarse "quark" of a frog in distress, and a brief search will almost invariably reveal a leopard frog in the jaws of one of these snakes. The size of the frog which they can eat with comparative ease is scarcely creditable. Tadpoles are also eaten voraciously, and I have opened the stomachs of snakes which were fairly gorged with them. The snakes swim freely about in the pools and probably capture small fish as well as tadpoles.

About the margins of the lakes it is also abundant, although generally it does not appear to be as numerous in this habitat as about the sloughs. Abundant as it is in swampy habitats, however, *radix* is far from being confined to these conditions, and we have often taken individuals on the hills (fig. 24) half or three quarters of a mile from water during dry hot days in July and August. In such places, however, they are found commonly only in the morning or evening or on wet and cloudy days, seeking the protection of holes during the heat of the day. Their food habits on these ridges are necessarily somewhat different than in the sloughs. I have observed specimens in August in the stubble, and in and about the shocks of grain, capturing the small tree frog (*Chorophilus nigritus*). These tree frogs are, however, of rather rare occurrence in this region, and for its food *radix* must depend upon other forms. One of these is that staple article of diet for so many of the plains forms in the fall—the grasshopper. This insect occurs in great abundance in late summer and furnishes food for such a variety of animals as wolves, foxes, badgers, gophers, cranes, grouse, and hawks. I have often seen these snakes coiled up on a shock of wheat with a grasshopper's legs protruding from the corners of its mouth, and there can be little doubt that it forms an important part of the food in the upland habitats. It is very possible that they also rob the nests of the field mice which are often made in the shocks of grain, for young mice are often found in the nests at this time which have not as yet gotten their eyes open, and would thus fall an easy prey. During September they have also been seen in newly

opened furrows in the plowed fields seizing the earthworms that are turned out by the plows. In the stomachs of specimens from a patch of upland prairie in Clay County, Iowa, I found two small mammals and a bird. All of these had undoubtedly been found dead, as they were all badly flyblown. This indicates that *radix*, like other members of the genus (see notes on *sirtalis* and *elegans*), will occasionally eat dead animals. However, even in the upland habitats, the principal food of *radix* in the prairie region is the leopard frog. Where there is long grass this frog may, in western Iowa, be found quite commonly a mile or more from water. In view of the intense heat and drouth of the hot summer days it seems rather

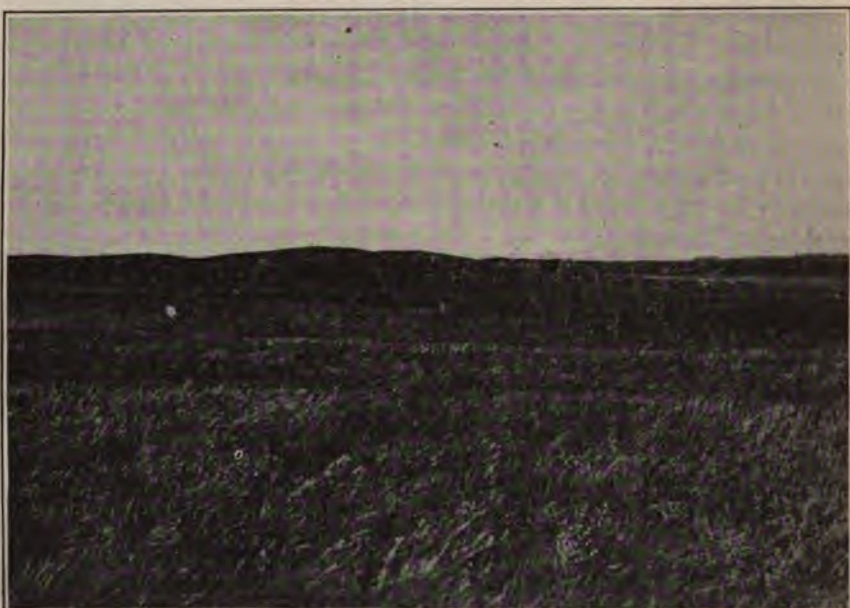


FIG. 24.—HABITAT OF THAMNOPHIS RADIX AND T. SIRTALIS PARIETALIS. MORAINIC HILLS IN CLAY COUNTY, IOWA. T. RADIX IS FREQUENTLY FOUND ON THESE GRASSY RIDGES, A MILE OR MORE FROM WATER. T. SIRTALIS PARIETALIS IS ALSO FOUND IN THIS HABITAT, BUT ONLY RARELY.

remarkable that the frog can live in these habitats. Its ability to do so is apparently due to the fact that the dense growth of grass is wet with dew for the greater part of each day, for where it is grazed closely frogs are very scarce.

Coues states that they are preyed upon by hawks. I have seen this several times, but an even greater enemy is the American bittern, which nests in great abundance about the margins of the sloughs. These birds feed voraciously on both frogs and snakes.

Very little is known of the breeding habits of *radix*. Coues and Yarrow (1878, 278) state that "the greater part of the females observed in July and August will be found pregnant, the young number-

ing sometimes as many as 30 or 40." I have examined pregnant females in July, August, and September in western Iowa that contained from 17 to 25 young, and have kept females in captivity that gave birth to young on August 31 and September 7, 8, 29, and 30 (1907). By the size of some of the embryos examined I believe that broods may appear as early as the latter part of July.

The period of gestation is uncertain. Coues states that "individuals were taken in coitu in September and part of October. So as it is unlikely that young are born after this date, this observation might be taken to indicate a period of gestation protracted for the greater part of the year." This observation is difficult to explain. It is hardly possible that more than one brood is raised each year, and those that appear in October are probably belated first broods. Likewise it is highly improbable that the period of gestation is protracted over the winter, since such is not the case in the other species of the genus in which coition has been observed. The probabilities are that coition takes place in the spring, and that Coues was mistaken in his observation or was viewing abnormal cases.

Coués (1878, 278–279) writes that *radix* is abundant along the northern boundary of the United States, and Branson (1904, 364) adds that "It has a wider distribution and occurs in greater numbers than any other Kansas garter-snake." I have already observed that it is very common in northwestern Iowa. At times it occurs here in such numbers as to become a veritable nuisance. Particularly was this true in the summer of 1892, when it became extraordinarily abundant. But, while it occurred in numbers about the barns and outbuildings on higher ground, it was most noticeably abundant in the sloughs and about the lake shores, which fairly teemed with them. Hundreds of individuals could be observed lying on the rocks along the shores of these lakes or swimming freely in the water. This remarkable development was doubtless due to the advent of unusually favorable conditions; and it may be significant that this was an exceptionally wet year. After 1892 the number apparently fell off rather suddenly, for they were not observed to be noticeably abundant until 1896, when, according to a number of residents, they again became very numerous, although not as much so as in 1892.

The abundance of *radix* over most of the prairie region and the fact that it is here of general distribution and not confined to a particular habitat, indicates, it seems to me, that, unless it changes its habits, we may expect that toward the limits of the prairie it will become more closely confined to the conditions to which it has become adjusted in the heart of its range, and will finally be limited in a general way by the boundary of the prairie-plains conditions.

Range.—The geographic location of *radix* is the prairies and plains of central North America north of the 37th parallel. This region is a continuation of the prairie and plateau regions of Texas, and like these regions is bounded on the west by the Rocky Mountains and on the east by the forests of eastern North America. The prairie-plains region lies against the foot of the Rockies, at an elevation of about 5,000 feet, and from here eastward descends gradually in broad flat surfaces to eastern Nebraska and Kansas. From here eastward it extends as a slightly descending peninsular extension of the treeless conditions of the great plains, through Minnesota, Iowa, Missouri, and Illinois into the western part of Indiana, everywhere abutting against the forests of eastern United States. The topography of the greater part of the prairie peninsula is glacial, and is characterized by a thick mantle of waste evenly spread, or heaped into rolling moraines or loess bluffs, with intervening depressions containing lakes, ponds, or swamps, according to their depth. The characteristic vegetation consists of grass formations that not only occupy the uplands, but also the sloughs. The river valleys and lake shores alone support arborescent associations.

The western part of this prairie region (approximately between the eastern boundary of Kansas and Nebraska and the 98th meridian) is a continuation of the prairie region of central Texas, with which it connects in a narrow belt just west of the Ozark Highlands, and it extends to the northward in eastern Kansas, Nebraska, and Dakota far to the north of the Canadian boundary. The plains region which lies between the prairie and plateau regions includes the Staked Plains of Texas and extends to the northward beyond the Canadian boundary. The topography is without striking relief and the valleys of the rivers are broad and shallow. The vegetation is characterized by the peculiar bunch-grass formation, although the valleys carry the prairie formations far beyond the prairie region proper.

The drainage of the entire treeless area of central North America north of the 37th parallel is tributary to the Mississippi, with the exception of the areas that lie within the hydrographic basins of the Great Lakes and the rivers draining into Hudson Bay and the Arctic Ocean. In the United States the streams flow eastward across the plains, the larger ones (the Arkansas, Platte, and the Missouri) having their origin far up in the Cordilleras. Across the great plains they flow in broad shallow valleys, but as the altitude increases toward their source the main waterways sink their channels into the level surface of the plateaus, dividing this major physiographic feature into a number of table-lands whose margins are deeply dissected into bad lands by the secondary tributaries. Topographically, therefore, the aspect of the prairie-plains region is essentially that of a level plain; there are no distinct physiographic barriers, and

the whole area is united into a uniform feature by its treeless condition. It is the grass-land area of North America. In spite of this uniformity, however, the division of the area into the plains and prairie regions is a real if not a well-marked one, and seems to be due to differences in the climatic conditions.

Extending as it does from Texas nearly to the Arctic Circle, and having an extreme width of about 18 degrees of longitude, the prairie-plains region presents a considerable variety of climatic conditions. In general it is characterized by hot summers and mild winters, but extremes of temperature are not rare. The western part of the region is quite arid, for much of the moisture carried by the prevailing westerly winds that is not precipitated on the western slopes of the Pacific Mountains is condensed and precipitated as the air is again compelled to rise on the western slopes of the Cordilleras, so that in their subsequent course east of the Rockies these winds are desiccating agents. The plains are thus characterized by small rainfall (less than 30 inches) and a large proportionate evaporation. Transeau (1905, 884) has shown that when the ratios between the rainfall and evaporation are mapped for different localities, the plains are marked by a rainfall equal to 20 to 60 per cent of the evaporation called for. This in part accounts for the more xerophytic nature of its flora. Approximately between the 97th and 98th meridian the rainfall increases to the eastward above 30 inches, and the rainfall-evaporation ratios rise to between 60 and 80 per cent, and the more favorable conditions are marked by the presence of the more mesophytic grass formations of the prairie region. Where the evaporation ratios rise above 80 per cent the prairie region gives way to the dense forested area of eastern North America.

Specimens of *radix* with definite locality labels have been examined as follows: Lake Winnepeg, Rush Lake, Regina, Canada; Pueblo, Greeley, Fort Collins, Colorado; Du Page County, Sycamore, Chicago, Berwyn, Lake County, Palos Park, Mount Carmel, Illinois; Clay County, Palo Alto County, Ames, Iowa; Peabody, Fort Riley, Kansas, Fort Snelling, Mankato, Minnesota; St. Charles County, St. Louis, Madison County, Missouri; Threeforks, Miles City, Fort Benton, Montana; Loup Fork, Fort Pierre, Nebraska; Pembina, Turtle Mountains, Mouse River, North Dakota; Hermosa, South Dakota; Dallas, Texas; Racine, Madison, Kenosha, Wisconsin; "Bridgers Pass," Fort Laramie, Wyoming.

As we have previously said in the discussion of the geographic conditions, the prairie-plains region is not to be distinguished from the plains and prairies of central and western Texas. At the present time, however, we have no evidence that the form enters the latter except possibly in the extreme northern part, in Oklahoma and Indian Territory, although the southern margin of the range of *radix*, like the

northern boundary of *marcianus*, is very imperfectly known. The southernmost localities in the plains from which *radix* specimens are definitely known are Scott and Marion counties, Kansas, so that the ranges of *radix* and *marcianus* are at least adjacent if not adjoining or even overlapping. There is no evidence at present to indicate an overlapping, except the single specimen recorded by Cope from Dallas, Texas. This is without question a typical specimen of *radix*, but the record should be held in reserve until it has been substantiated by further collecting; it suggests, however, that the range of *radix* may be found to extend farther south in the prairie region of central Texas than on the more arid plains to the west, which would be in accordance with our knowledge of the habitat relations of the form. If the respective ranges of *marcianus* and *radix* overlap in the debatable territory in Oklahoma and southern Kansas it can not be to any great extent, and we believe that we are safe in considering that the southern boundary of *radix* on the plains approximately conforms to the northern boundary of *marcianus*.

The northern termination of the domain of *radix* is even more imperfectly known than the southern, and it is difficult to even approximate it, for here, as to the south, the plains conditions are evidently continued far beyond the range of the form. The notes and specimens of Coues (1878, 278) indicate that it is abundant on the northern boundary of the United States from the valley of the Red River to the foothills of the Rocky Mountains, but that it also occurs farther north is indicated by the specimens in the U. S. National Museum from Regina and Rush Lake, Assiniboia, British Columbia, which at present seem to be the most northern localities in which it has ever been taken.[a] The extent of its northern occurrence is probably dependent upon its ability to endure the lower temperatures that characterize this region, and since snakes are as a rule a warm climate group, and apparently can not stand extremely cold conditions, we may expect to find the northern limits of the area occupied by *radix* not far north of Regina.

As was noted in discussing the habits of *radix*, even in the more moist parts of its domain, it apparently prefers the wet swamps to the dryer uplands. From this it may be expected that the western boundary of its range is not determined by the Rockies themselves, but by the high arid table-lands that border them on the east. It is easily conceived how a form of more or less general distribution on the prairies but having a preference for moist habitats might, on the more arid plains to the west, become more closely confined to these conditions, to its exclusion from the plains, and be carried far west-

[a] There is a single specimen (No. 9251) in the U. S. National Museum labeled "Lake Winnepeg" collected by Doctor Gunn, which, although a typical specimen of *radix*, can not be considered here, for the locality is evidently a general one.

ward in the valleys of the streams, as they are sunk into the plains by the increase in elevation, in a manner somewhat analogous to the extension of the range of the prairie types into the plains region (Pound and Clements, 1900, 74–78). Of course, the records available are too meager to ascertain the actual state of affairs, but it may be significant that within the region where the plains reach a height of 5,000 feet the Colorado and Montana localities at which *radix* has been taken (Pueblo, Fort Collins, and Greeley, Colorado, and Threeforks, Montana) are all in the valleys of the Arkansas, Platte, and Missouri rivers, which have cut their channels well below the higher levels of the plateaus.

It is unfortunate that reliance can not be placed on the locality given for three specimens of *radix* in the U. S. National Museum (Bridgers Pass), but the locality given is probably but a general one, so that we have no evidence at present as to what extent, if any, this form has pushed westward through this gap in the Rockies. The record suggests, however, that *radix* may follow the tributaries of the North Platte well across the Laramie plains, that form a break in the continental divide at this point.

To the eastward of the plains region the records indicate that *radix* occurs throughout the prairie region. The northern limit to which it is actually known to occur may be represented by a line drawn from Pembina, North Dakota, southward through Fort Snelling, Minnesota, and Madison, Wisconsin, to Racine, on Lake Michigan. This line corresponds quite closely to that of the common boundary between the northern coniferous forest and the prairie in these States, and it might be concluded, since *radix* is a prairie form, that this approximately represents the actual northern limit in this region. There can be little doubt, I think, that the margin of the prairie in Minnesota and Wisconsin does determine the northern limit of the principal distribution of *radix* in this region, but as the tension line between the forest and prairie is not a sharp one, but marked by a transition zone of brush prairie and open woods, while for a considerable distance within the forest area proper there are tongues and patches of prairie conditions, it is very probable that *radix* will be found in these habitats somewhat within the forest area. If a line be drawn from Lake in the Woods to Mille Lac, Minnesota, and from this point through Dunn, Eau Claire, and Jackson counties, Wisconsin, to Racine, it will roughly indicate the northern limit of the outlying habitats related to the prairie, and I believe that *radix* will not be found to occur much beyond this line.

On the south and east the prairie peninsula is also limited by the forest, and its border is the tension line between the prairie and the deciduous forest of southeastern United States. As mapped by Pound and Clements (1900), this boundary lies mostly to the north of Mis-

souri, bending southward in Illinois to include most of that State above the latitude of St. Louis. Above this latitude in Missouri and southern Iowa, however, the extensive meadows and open character of the woods relate this region to the prairie proper, and it is doubtless for this reason that we find *radix* extending southward to St. Louis, Missouri, and, although its southern boundary is not definitely known, it probably approximately coincides with the border of the southeastern deciduous forest that lies a little to the south of these localities, curving around the northern boundary of the Ozarks to the 98th meridian.

Illinois north of the 39th parallel is true prairie, and *radix* is known to occur throughout the State above St. Clair and Wabash counties, but in western Indiana, which is not a prairie State, the prairie comes in contact with the forest and breaks up into grassy peninsulas and islands that might be expected to introduce *radix* well beyond the prairie proper. Nevertheless, the most eastern localities for which we have authentic records are Chicago and Mount Carmel, Illinois. In 1881 Hay (1881, 738) recorded a specimen of *radix* in Butler University. He says of this specimen that "it is a good and well-characterized specimen of *Eutænia radix*, that I have every reason to believe was found at Irvington, near Indianapolis. The species is found at Bloomfield, Illinois, and is included by Dr. W. H. Smith, in his Catalogue of the Reptiles and Amphibians of Michigan, as occurring in that State." In 1887 (1887, 65) he includes it in his list of Indiana Reptiles and Amphibians. Doctor Cope (1888, 400–401) described as a new variety (*melanotænia*) two specimens of *radix* presumably from Brookville, Indiana, and we have examined two specimens from Purdue University, belonging to the Butler collection, and presumably also from Brookville. Unfortunately, however, doubt attaches to the locality of all of these specimens. Hay did not seem absolutely sure that the Butler University specimen came from Irvington, and in the case of the Purdue specimens no locality is given, while a third is labeled "Illinois; collector, A. W. Butler." I believe, therefore, that while it is very probable that *radix* will be found in western Indiana, particularly in meadows and clearings, the present records can not be accepted as evidence of its occurrence in the State.

In general, then, the range of *radix* may be defined as the plains and prairie regions of central North America. Owing to its preference for wet, marshy habitats it is more generally distributed in the prairie region and pushes slightly to the eastward beyond this feature in the encircling brush prairie zone, but is limited by the margin of the forest of eastern North America, while to the westward it enters and extends entirely across the plains region, possibly by adhering, in a general way at least, to the valleys of the large streams, which also ›rt a well-defined flora of the prairie type (fig. 25).

FIG. 25.—DISTRIBUTION OF THAMNOPHIS RADIX, AS INDICATED BY THE LOCALITY RECORDS.

Variation.—After examining hundreds of specimens I believe it to be unquestionable that we have to deal here with a single form which is sharply defined from the other garter-snakes of the prairie-plains region. Generally speaking, it may be defined as having 21–19–17, 19–21–19–17, or even 19–17 scale rows, 7 (8) supralabials, 142 to 176 ventrals, 57 to 87 subcaudals, and the lateral stripe on the third and fourth rows of dorsal scales, but while this description will serve very well for analytical purposes, it gives no clue to the relationships, and we have to examine the variations in detail. For the sake of unity of treatment, as well as for the fact that this character is less variable than the others, the number of dorsal scale rows will first be examined. The number (maximum) for *radix* has generally been given as 21, although the type had 19. Brown (1901) gives the number as usually 21, but occasionally 19, and Cope (1892, 651) states that the only specimen which he had examined with 19 rows

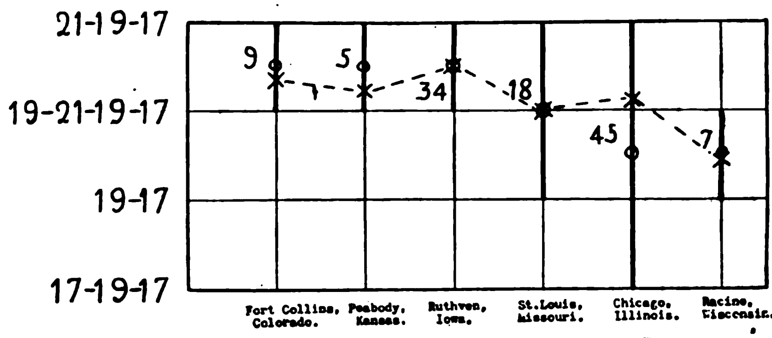


FIG. 26.—DIAGRAM SHOWING THE VARIATION IN THE DORSAL SCALE FORMULA IN THAMNOPHIS RADIX.

was the type An examination of the following diagram (fig. 26) will show the actual state of affairs.

This table shows clearly that *radix* is not characterized by a single dorsal scale formula in any part of its range, but the formula 19–21–19–17 occurs the most frequently in all localities. While, however, the range of variation is extensive, and the arithmetical mean remains nearest to the formula 19–21–19–17, we believe that the diagram is correct in indicating as it does that there is a tendency toward a larger number of rows in the more western localities. This is apparently shown both by the displacement of the mean from the formula 21–19–17 toward or below the formula 19–21–19–17, in the eastern localities, as well as by the lowering of the minimum number toward the formula 19–17 or below, in the same direction.[a]

In plotting this diagram we have only used the localities from which we have the largest number of specimens, and still the series from the

[a] This decrease in the number of rows in eastern localities explains how the type of species (which came from Racine, Wisconsin) came to have 19 scale rows.

plains region are so small that our conclusions might with justice be objected to on this ground. If we examine all of the specimens from the region west of the 97th meridian, however, regardless of locality, we find that there is not a single specimen in the lot that has less than 19–21–19–17 scale rows in the dorsal series, although about half have the formula 21–19–17, while in but a small series from Racine 19–17 is

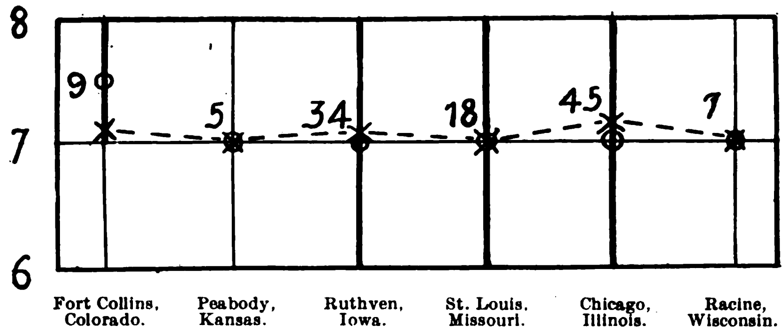


FIG. 27.—DIAGRAM SHOWING THE VARIATION IN THE NUMBER OF SUPRALABIALS IN THAMNOPHIS RADIX.

the common formula. I believe, therefore, that it is indisputable that a decrease in the mean number of rows toward 19–21–19–17 rows or less takes place in the western part of the prairie region.

The number of superior labials have been variously given as 7, 8, and 7, occasionally 8. I have plotted the number for various localities in the diagram, fig. 27, and an examination of this table shows that the average number is very close to 7 throughout the

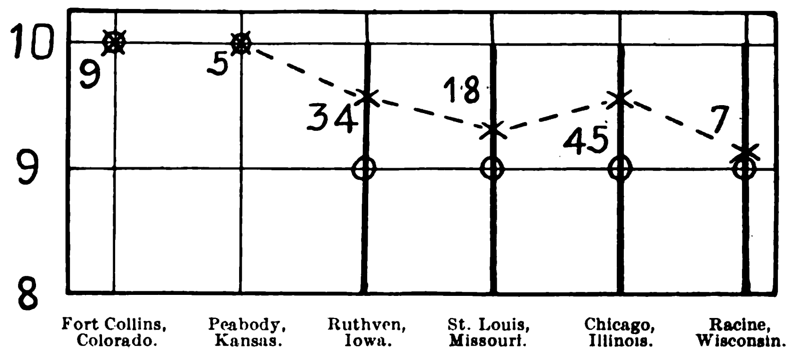


FIG. 28.—DIAGRAM SHOWING THE VARIATION IN THE NUMBER OF INFRALABIALS IN THAMNOPHIS RADIX.

range. Indeed, so close does the mean approximate 7 that no geographical variation in the average number can be detected with the series at present available. On the other hand, it should be pointed out that it is only in the specimens from the prairie region that less than 7 superior labials are found. Very similar conditions exist in the case of the inferior labials. Thus, in the diagram, fig. 28, it will

be seen that there may be 8, 9, or 10 in this series, but that 8 infralabials have only been found in the prairie region. In the case of both the superior and inferior labials we readily admit the possibility that larger series of plains specimens may destroy this apparent tendency toward a decrease in the number of plates to the eastward, but we do not think that it is probable, for, as in the number of dorsal scale rows, an examination of all of the plains specimens has failed to turn up a single specimen with 6 superior or 8 inferior labials, so that if these numbers exist in this region it must be in small proportion.

If the tables represent the true state of affairs, then *radix* evidently tends to become slightly reduced in the number of dorsal scale rows and inferior and superior labial plates in the prairie region. (The mean number of subcaudals and ventrals, subject, as they are, to a considerable range of sexual and individual variation, can not be determined in the small series at hand.) However this may be, one thing at least is certain, and that is that *radix*, as a form, does not have a constant number of scale rows and labial scutes. This is shown not only by the frequency of the variations that occur, but also by the fact that the dorsal scale formula is so frequently 19–21–19–17 (which is a transition stage between the formula 21–19–17 and 19–17) and the fact that generally when the labial formula is 8/10 the third superior and the corresponding inferior labials are noticeably reduced. This is significant, as it indicates, we believe, that the form is a dwarfed offshoot of a stock with a larger scutellation.

The variations in color have but thrice been thought of subspecific value. In general, as previously described, the ground color is brown, with three stripes (the lateral being on the third and fourth rows and the dorsal on the median and halves of adjacent rows), and three rows of black spots on the skin and involved scales. In western specimens, from Kansas and Nebraska, the ground color is light brownish olive, and the black spots are consequently very distinct. The dorsal stripe is very conspicuous, being usually bright orange yellow, and often covering more than the median and halves of the adjoining rows, the lateral stripe being usually pale yellow and less conspicuous. The interspaces on the skin between the spots are usually whitish. This coloration was described as a species (*haydeni*) by Kennicott in 1860 on the basis of a specimen from Fort Pierre, Nebraska, that was further characterized by having the interspaces on the skin between the lateral spots red instead of the usual whitish. This color in the type specimen has now faded, but a specimen in the possession of the Academy of Natural Sciences of Philadelphia (No. 16619) from Peabody, Kansas, shows the same coloration. In this individual the interspaces on the skin and the edges of the involved

scales are a dull brick red, giving rise to a pattern that resembles very much some specimens of *parietalis* from the same region. This specimen is, however, the only one which we have observed with this development of red pigment, and the trait must be considered as of rather uncommon occurrence and not as typical of specimens from this region.

The "*haydeni*" type of color, as above described, may be considered in general as typical of specimens from South Dakota, Wyoming, Nebraska, Colorado, and Kansas, but to the east and north of these points the ground color becomes darker brown, and even black, somewhat or entirely obscuring the spots. The stripes in prairie specimens remain much the same as in western ones, but the dorsal tends to lose its golden tinge. Doctor Coues (1878, 277–278) states that Pembina specimens are "olivaceous-blackish or obscure brownish black," and that this color occurs as far westward as the Coteau de Missouri on the northern boundary, but that in the arid region of the upper Missouri and Milk rivers it is replaced by a form whose principal character is seen in the increased breadth and intensity of coloration of the dorsal band, especially on the anterior portion. To this western form Coues and Yarrow (1878, 279–280) gave the name of *radix twiningii*. Western Iowa specimens are as a rule darker than those from Kansas and Nebraska, and show their close color affinity mostly in the golden yellow dorsal stripe, and it is evident that these specimens are to be considered as intermediate between the more pallid western pattern and its darker eastern representative. That the color tends to become darker to the northward as well as to the eastward is shown by the fusing of the spots on the skin in specimens from Turtle Mountain and Regina.

The third color variety has been described by Cope (1888, 400–401) on the basis of two specimens reported to have been taken at Brookville, Indiana (see p. 80). The principal characteristic of these specimens was the elongation and fusion of the gastrostegeal spots to form a broken band along each side of the abdomen; not an uncommon occurrence in the darker eastern representatives of this form.

None of these phases differ sufficiently to indicate well-marked forms or to be given subspecific rank, and they have been dropped by later writers.

In the above discussion of the variations of *radix* I have purposely excluded from consideration three specimens (Nos. 30872, 30873, 30874) in the U. S. National Museum from Milwaukee County, Wisconsin. These specimens are typical *butleri* in coloration, and the lateral stripe is upon the third and adjacent halves of the second and fourth rows. In scutellation they agree both with *butleri* and with reduced specimens of *radix*. The scutellation is as follows:

Table of scutellation.

U. S. Nat. Mus. No.	Supra-labials.	Infra-labials.	Ocu-lars.	Tempo-rals.	Sub-cau-dals.	Ven-trals.	Total length.	Tail length.	Dorsal scale rows.
							mm	*mm*	
30872	7	8-9	1-3	1-1 / 1-2	66	146	462	123	19-17
30873	7-8	10	1-3	1-2 / 1-1	64	145	397	97	19-17
30874	6-7	8-9	1-3	1-2 / 1-1	66	142	450	120	19-17

Definite conclusions can not be based upon such a small number of specimens, but, granting the accuracy of the locality, it should, I believe, be concluded that these specimens are more than usually dwarfed specimens of *radix,* and that the lateral stripe has become slightly displaced in the reduction in the number of scale rows below 21. It is true that the writer has seen little evidence that the lateral stripe tends to be disturbed in position when the fourth row is lost (see also pp. 36–37), but in at least one specimen (Cat. No. 525, U. S. N. M., from Racine, Wisconsin), which has 19–21–19–17 rows, the lateral stripe apparently tends to descend upon the second row, where the fourth row is dropped to leave less than 21. This point should be carefully tested by the examination of a large series of specimens from eastern Wisconsin.

Affinities.—If the lateral stripe is a safe index there can be no uncertainty as to the inclusion of *radix* in the group to which we have given its name, as there is no doubt as to the position of the lateral stripe on the third and fourth scale rows. Just what its relation is to *marcianus* is undetermined at present, but that it is not distantly related to *megalops* is quite evident both from the position of the lateral stripe and general coloration. Cope, in his assertion that *megalops* is the representative of *radix* in Mexico, apparently recognized the similarity of the forms, as did also Brown in 1904 (1904, 471), when he stated that "*E. radix* is a connecting link on the one hand with *E. proxima,* * * * and on the other in the southwest with *E. megalops.*"

If, as I believe, *marcianus* is a member of the *Radix* group, it is not likely that *radix* and *megalops* are directly related, and this improbability is enforced by the gap between their respective ranges. It seems more probable that *marcianus* constitutes a link between *radix* and *megalops,* and the closeness with which its range coincides with the region between these two forms lends support to this view. At any rate, *radix* can not at the present time be connected with any other form in the same or adjacent regions, with the exception of *butleri,* which will be discussed later. It differs constantly from *sirtalis, eques,* and *elegans* in the position of the lateral stripe, and from *proximus* and *sauritus* in the same region by the increased number of scale rows and the persistently shorter

tail. It is difficult to determine what basis Brown had for the statement that it is a connecting link between *proximus* and *megalops*, other than the general relationship expressed by the position of the lateral stripe, for the range of *radix* and *proximus* overlap to a considerable extent without affecting the purity of either type. Rather it seems, as I shall try to show later, that *radix* and *proximus*, although both members of the same division (see table, p. 40), have had an independent origin from a common stock.

It has already been noted that to the eastward on the prairie peninsula *radix* exhibits a tendency toward a reduced scutellation, and that in this reduction the scale formula 19–17 is approached. This brings *radix* very close to another form (*butleri*), whose western limit, as far as we know at the present time, is close to the eastern limit of *radix*, and makes it necessary to examine this form before the affinities of *radix* in this direction can be discussed.

BUTLERI.[a]

Description.—East of the prairie peninsula, in Indiana, Ohio, southern Michigan, and western Pennsylvania, *radix* is replaced by a form which, like it, is a very distinct and well-marked one. In this form, which has received the name of *butleri*, the ground color is dark olive brown, the lateral spots when visible on the scales being small and restricted to the scale rows adjacent to the stripes, along which they tend to form narrow broken black borders. On the skin these spots are very seldom to be distinguished in definite rows, being more often partially fused, leaving the interspaces irregularly arranged. The dorsal stripe is usually on the median and adjacent rows, and is bright yellow anteriorly but quickly fades out to a dull yellow posteriorly. The lateral stripe is broad and conspicuous, occupying all of the third and most of the second and fourth rows anteriorly, but posteriorly, where the fourth row is dropped, it falls on the second and third rows only, and retains this position to the vent. Anteriorly the color of the lateral stripes is bright yellow; posteriorly they are generally somewhat duller, still retaining, however, their yellow tint. The first row of scales is but little, if any, lighter than above, which serves to accentuate the conspicuousness of the lateral stripes.

The scutellation may be summarized as follows: Dorsal scale rows 19–17, occasionally 17–19–17–15, superior labials 7 or 6, ventrals 132 to 154, subcaudals 49 to 68.

Butler's garter-snake has had a rather peculiar history. Described in 1888 by Cope, on the basis of a single specimen said to have been

[a] *Thamnophis butleri* (COPE), Proc. U. S. Nat. Mus., XI, p. 399. Includes *E. brachystoma* COPE, in part *E. sirtalis* BROWN, in part *E. sirtalis obscura* COPE, and in part *E. sirtalis obscura* MORSE.

taken at Richmond, Wayne County, Indiana, the type remained for many years the only specimen known. In 1901 Mr. Brown (1901, 27) noted that there were two specimens in the Academy of Natural Sciences of Philadelphia labeled "Miami River" which had been identified as this form by Cope, but as these with the type were the only specimens known at the time he considered them rather anomalous specimens of *sirtalis,* on the basis of the similarity of scutellation. In 1894 Doctor Stejneger (1894, 593–594) recorded a specimen collected in Waterloo County, Indiana, that corresponded closely to Cope's description of *butleri,* and contended for the distinctness of the species. Later the writer (1904, 289–299) found it to be common in southern Michigan, and has subsequently examined material from various parts of Indiana, Ohio, and western Pennsylvania, which indicates that it is a common form in these States, as well as a distinct species.

At first sight it seems rather surprising that a form as common as this one has proven to be should have remained so long unobserved in an area that has been so well worked. The explanation that at once suggests itself is the one put forward by Stejenger—that it has been confused with other forms that resemble it. This has proven to be the case, for we have found specimens from southern Michigan in the Cope collection in the Academy of Natural Sciences of Philadelphia, labeled both "*sauritus*" and "*sirtalis,*" but perhaps the most striking instance is that it has frequently been confused with the questionable form *obscura.* It has always been a doubtful question to those who have considered the matter as to just what form or combination of characters the name *obscura* has been considered to apply by those who have used it. Cope distinguished it from *sirtalis* by the fusion of the lateral spots on the skin, a rather dubious character. A possibility of error immediately arose in that *butleri* is characterized by an obscurity of these spots, and, although the type specimen of *obscura* was clearly *sirtalis,* as will be shown later, subsequently to its description Cope labeled two specimens from Michigan in the Philadelphia Academy collection as "*obscura*" which are clearly *butleri. Butleri* in coloration somewhat resembles *sauritus,* and Cope (1888, 399) stated that *obscura* "resembles at first sight the *E. sauritus,*" thus shifting the name *obscura* to include *butleri* specimens. The basis for this statement were the two specimens from Indiana, which he referred to *obscura* and which were probably *butleri,* although the original description of *butleri* immediately follows. It is also very likely that the specimen recorded by Hay (1892b, 526) as possibly belonging here was also a *butleri,* as he quotes Cope's statement that *obscura* resembles *sauritus.* One of the specimens listed as *obscura* by Morse (1904, 134) also proves upon examination to be *butleri.*

The only other form which has been confused with *butleri* is the *Eutaenia brachystoma* of Cope. *Brachystoma* was described as distinct on the basis of the small number of ventrals and superior and inferior labial plates in the type, and although the reduction in specimens from Pennsylvania is considerable, I have already given my opinion (Stone, 1906, 165) that they represent dwarfed specimens of *butleri*. I have also shown (1904) that the specimens referred to *brachystoma* by Clark (1903, 83–87) are typical *butleri*.

Habits and habitat relations.—It is not to be expected from the history of this form that much would have been recorded on its habits,

FIG. 29.—HABITAT OF THAMNOPHIS BUTLERI. CREEK AT LIMA CENTER, WASHTENAW COUNTY, MICHIGAN. T. BUTLERI IS FOUND COMMONLY ON THE BANKS OF SUCH STREAMS IN SOUTHERN MICHIGAN.

when so little has been ascertained of the habitat relations of forms which have been well known for fifty years or more. In southern Michigan I have only taken it in the immediate vicinity of water, either about the margin of swampy places or on the banks of streams (fig. 29). This may be a coincidence, but it is in accord with all of the specimens collected throughout the range which have habitat data. I have found them most frequently by overturning boards, etc., in such places, although they are also found crawling about in the long grass and herbage.

It is in disposition a rather sluggish snake, seldom attempts to defend itself, and when surprised is usually easily captured. The ease with which they are captured is in part due to their inability to escape, owing to the extreme awkwardness of their movements on land. When moving slowly this is scarcely noticeable, but when they attempt to move rapidly to escape capture their efforts are peculiarly odd and ineffective. The movements consist in throwing the body in long curves in a manner closely analogous to the wiggling motion by which garter-snakes swim in deep water, and which results in much movement and muscular effort, but very little progress. This movement may be greatly augmented by putting the snake on a smooth surface, but it is not entirely due to the nature of the surface, as it can scarcely make any headway on a surface where *sirtalis* will glide away with comparative ease. This is one of the most striking characteristics of *butleri* and was first noticed by Reddick (1895, 261), who comments upon it in the following words: "It is short and chubby, and its movement is very characteristic of it. It does not have the gliding movement of *E. saurita* nor the swift and active movement of the *Natrix sipedon*, but seems rather to exert a large amount of force to do little crawling. The movement is so characteristic that I believe anyone having once seen the peculiar way in which it tries to hurry itself away would ever after be able to recognize it at a distance."

Fortunately no doubt attaches to the species which Mr. Reddick had, for the specimen upon which this observation was based has been examined, and it is unquestionably a *butleri*. The movement seems to be very similar to the method of locomotion described for the so-called *atrata* specimens of *ordinoides* by Ditmars (1907, 227).

Observations upon the food habits of *butleri* are but fragmentary. As announced in 1904, it is fond of earthworms and small frogs, but I have since found that in captivity it apparently prefers small fish. As a rule it is impossible to get them to take either worms or frogs if dead, but it is apparently a matter of unconcern to them whether the fish be alive or dead, as they will greedily eat specimens of the latter which have begun to decompose. Young individuals four or five days old will eat as many as three or four small minnows successively.

Females taken in July are usually pregnant, and the number of young is apparently small. In the specimens examined the number of embryos is about twelve to fifteen. One specimen which was taken in late July, 1905, and kept in captivity gave birth during the first part of August to ten young. The members of this brood were not all born on the same date, but appeared at different times

between August 7 and 20, a difference of thirteen days. This is an unusual occurrence among the garter-snakes, and is undoubtedly abnormal, for, as far as we have observed, it has been invariably the rule that the entire brood appeared within a few hours at most. We have seen but one other specimen give birth to young, and there were four in this brood. The young when but a few days old will struggle eagerly with earthworms or minnows, capturing the latter in a small dish of water or taking them from the fingers. For the first three or four days they are very secretive and can be seen only by overturning the moss and stones in the cage, except when they come out to feed. They have not been observed to feed during the first three days, but after this they will come out freely to gorge themselves on fish, returning again beneath the stones when satisfied. One of these young snakes was kept for three months, in which time it attained to the respectable length of 150 mm.

Range.—The area occupied by *butleri* may be considered geographically as an extension of the prairie-plains region, which gradually rises to the eastward and merges with the Allegheny plateau. The entire region was overridden by the ice sheets of the Glacial epoch, and the topography is determined by the thick mantle of glacial waste which has been spread over the underlying rock surface, as till sheets, moraines, outwash aprons, etc. The drainage is entirely to the Mississippi by way of the Ohio and its tributaries, with the exception of the small area in southern Michigan, northern Ohio, and northwestern Pennsylvania, which lies within the drainage basin of the Great Lakes.

The climate of the region is for the most part mild and rather humid, as is evinced by the character of the vegetation. The whole region is forested, with the exception of small scattered patches of prairie and a small area in western Indiana and southwestern Michigan, which is encroached upon by the extreme eastern end of the prairie peninsula. The rainfall of 30–35 inches that characterizes the prairie increases in this region to about 40 inches, and with this increase, as Transeau (1905) has shown, there is also a rise in the rainfall-evaporation ratios to 80–100 per cent. The forest is of the broad-leafed deciduous type of southeastern North America, but as over the greater part of the region under consideration (Ohio, Indiana, southern Michigan) the rainfall is less and the evaporation greater than in the southern Appalachians, where this forest has its principal development, the condition may be considered intermediate between those that accompany the development of the forest in the southeastern United States and those which obtain on the prairie, and the effect of the difference of conditions upon the vegetation is shown by the more open character of the woods on the uplands. It is generally

within this area of oak openings and open groves on the higher ground, which Transeau has shown to be associated with a rainfall-evaporation ratio of 80–100 per cent, that Butler's garter-snake is found (see Transeau's map, 1905, 885).

Specimens of *butleri* have been examined from the following localities: Ann Arbor, Chelsea, Ypsilanti, Washtenaw County, Brighton, Livingston County, Olivet, Eaton County, Pontiac, Oakland County, Michigan; Turkey Lake, Kosciusko County, Lake Maxinkuckee, Marshall County, Waterloo, De Kalb County, Indiana; Sandusky, Erie County, Columbus, Franklin County, "Miami River," Ohio; Franklin, Venango County, Port Allegheny, McKean County, Pennsylvania.

From these records it will be seen that Butler's garter-snake ranges over most of Indiana, Ohio, southern Michigan, and western Pennsylvania, but its exact limits can nowhere be more than approximately fixed, for the locality records are extremely few. In Michigan it has not been taken north of Pontiac, Oakland County, nor west of Olivet, Eaton County, but it is a very common form in both of these localities and doubtless extends farther north. South of this latitude it is a common snake in eastern Michigan, while the various localities in Indiana represent nearly the entire length of the State (Waterloo, De Kalb County; Turkey Lake, Kosciusko County; Lake Maxinchukee, Marshall County; and Richmond, Wayne County). Although the specimens in the Academy of Natural Sciences of Philadelphia labeled "Miami River" are also marked "Indiana," which would indicate that they are from the extreme southeastern corner of the State, the accuracy of the record can hardly be relied upon, and, as Mr. Brown has remarked (Ruthven, 1904, 289), they are probably from Ohio.

At the present time we know of but two authentic locality records for Ohio. We have already noted that one of the specimens which Morse (1904, 134) records as *sirtalis obscura* is a *butleri*. An examination of his material shows that his specimens of *obscura* comprise four garter-snakes from Columbus, Ohio, collected by Kellicot (not as Morse gives it, Sandusky and Columbus, collected by himself). Two speciments are *sirtalis*, but one an undoubted *butleri*. Although Morse apparently did not find this snake at Sandusky, it is a very common form there, and the Museum of the University of Michigan has received a number of specimens from Mr. E. L. Mosely, which were collected in that locality. Columbus is the southernmost definite locality from which *butleri* is known in Ohio, which is in nearly the same latitude as the most southern Indiana record, that of the type (Richmond, Wayne County). How much farther southward it occurs can only be conjectured, but as it is apparently less common

in these localities than to the northward the southern margin may be placed tentatively at the Ohio River.[a]

If we admit for the time being that *butleri* and *brachystoma* are identical, we find that for twelve years after its description the type of the latter (which was taken in Franklin, Venango County) represented the only Pennsylvania locality from which the form was known to occur. In 1905, however, Mr. H. F. Fowler, of the Academy of Natural Sciences of Philadelphia, secured a second specimen (Stone, 1906, 165) near Port Allegheny, McKean County. This specimen is of interest, as not only extending the range considerably to the eastward, but as also probably representing approximately the eastern

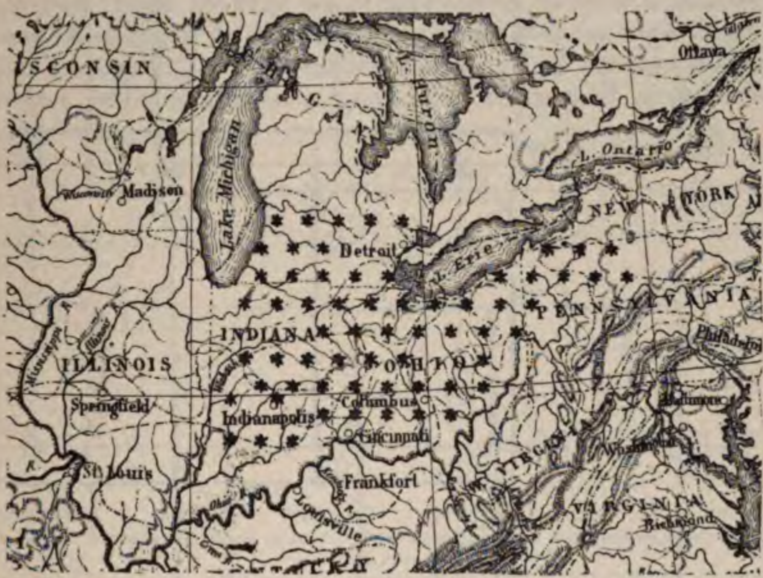


FIG. 30. DISTRIBUTION OF THAMNOPHIS BUTLERI, AS INDICATED BY THE LOCALITY RECORDS.

limit of its occurrence. These specimens will be further discussed in the consideration of the variation of the group.

At this point mention should again be made of the three specimens in the U. S. National Museum from Milwaukee, Wisconsin. I have given my reasons for referring these specimens to *radix*, but it must be admitted that they resemble *butleri* so closely as to be indistinguishable, and it may be that further material will show them to belong to this form and extend the range around the southern end of Lake Michigan, but the solution of the problem given on page 85 seems the most plausible one at present.

It is impossible with our imperfect knowledge of the limits of its range to point out any close relations between the distribution of

[a] As this paper is passing through the press I have received a specimen of *butleri* from Dayton, Ohio.

butleri and the conditions with which it is found associated. It must be acceded, in a general way, however, that, as far as our present knowledge goes, its range is apparently included in the area lying east of the prairie peninsula, which is characterized by the occurrence of open forests on the uplands (fig. 30). If, as I hope to be able to do, I can show that *butleri* is genetically related to *radix* this distribution may be easily accounted for by the fact that as *butleri* has prairie affinities, it might be expected to prefer conditions more in accord with those of the treeless region. I have already shown that the conditions in this region are somewhat intermediate between those of the prairie and the denser forests of southeastern United States, and, if a direct relationship exists between *butleri* and *radix*, the coincidence between the range of *butleri* and the open forest area may be accounted for by the affinities of both. This subject will be reverted to in discussing its affinities. It should be noted, however,

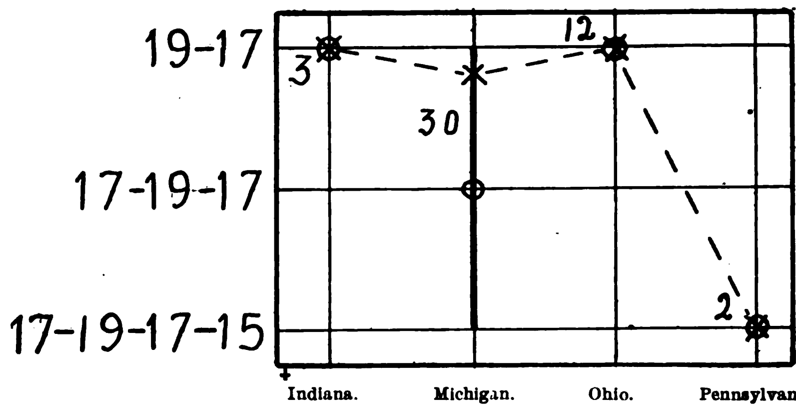


FIG. 31.—DIAGRAM SHOWING THE VARIATION IN THE DORSAL SCALE FORMULA IN THAMNOPHIS BUTLERI.

that the range of *butleri* is entirely within the glaciated area of eastern North America which would indicate that the form is of post-Glacial origin.

Variation.—The characters of *butleri* are quite constant and have not by their variability given rise to much confusion. The scale rows are invariably 19–17 in nearly all of the specimens examined, but it should be observed (fig. 31) that while a larger formula has never been observed, three of the Michigan specimens have the formula 17–19–17 and both of the Pennsylvania (*brachystoma*) specimens have 17–19–17–15, the smallest number observed. According to Cope, the type of *butleri* has 7 superior and 8 inferior labial plates, a formula that holds for the Lake Makinkuckee, Miami River, and Sandusky specimens (figs. 32 and 33). The Turkey Lake specimen has the same number, except on the right side, where one superior is to leave 6. At Ann Arbor and Olivet, however, 6 supra-

labials occur in practically one-half of the specimens, and, while the infralabials are occasionally 8, 9, or 10, the average is very close to 8. The single specimen from Columbus has 6/8, the one from Frank-

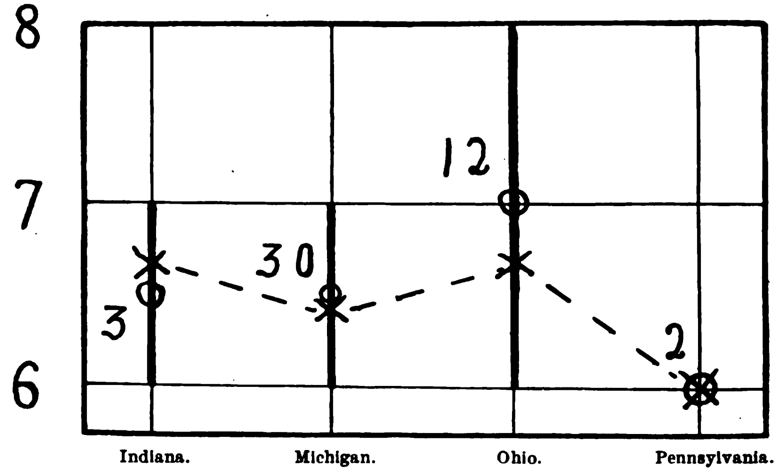


FIG. 32.—DIAGRAM SHOWING THE VARIATION IN THE NUMBER OF SUPRALABIALS IN THAMNOPHIS BUTLERI.

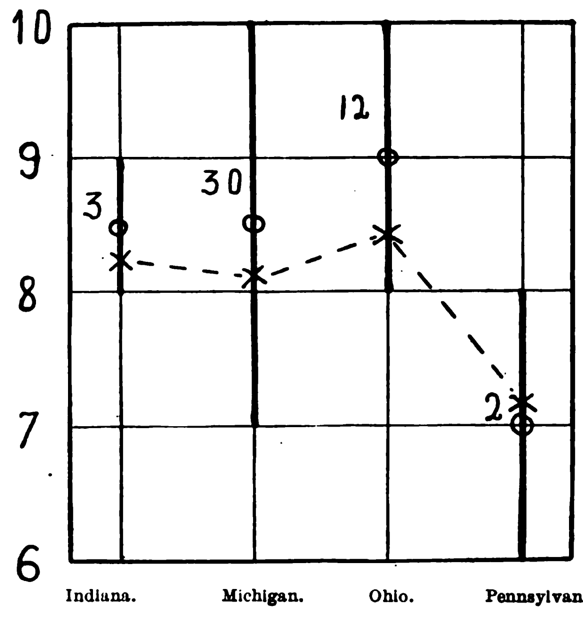


FIG. 33.—DIAGRAM SHOWING THE VARIATION IN THE NUMBER OF INFRALABIALS IN THAMNOPHIS BUTLERI.

lin, Venango County, Pennsylvania has 6/8, and Mr. Fowler's specimen from McKean County, Pennsylvania, 6/6–7.

An examination of the ventrals shows the following distribution: Ann Arbor, males 134–146, females 132–140. All of the Indiana

and Ohio specimens fall within these extremes, as do also both of the Pennsylvania. Subcaudals (Ann Arbor, Michigan), males 61–66, females 49–58. The male records are based on but few specimens, however, and the number probably ranges both lower and higher. Indeed, a male from Columbus shows 59. The type of *brachystoma*, although doubtful, is probably a male and has 72. In the McKean County specimen the tail is injured. The series are too small to reveal geographic differences, if they exist.

One must be cautious in drawing conclusions from such a small amount of data, but the fact that in very few specimens west of Pennsylvania does the reduction in the dorsal scale formula become so low as in the Pennsylvania specimens nor the labial formula as small as in the McKean County specimen seems to us to indicate a reduction in scutellation to the eastward, at least as far as these characters are concerned. At any rate, it is evident, as is shown by the diagrams, that *butleri* as a form is characterized by a very reduced scutellation.

Affinities.—The only form with which *butleri* has been confused is *sirtalis*. Its distinctness from this form has been pointed out (Ruthven, 1904, 295 and 298), and this distinctness is such that there is slight reason for deriving it from this form, from which it differs in the position of the lateral stripe, the number of labial plates, and color, while lying entirely within its range. It also differs from *sauritus* in the number of labial plates and in the tail length, and also lies entirely within its range.

Here again the difficulty in establishing relationships lies in the fact that the position of the lateral stripe is noncommittal. It is true that posteriorly it is upon the second and third rows, but this is frequently the case in forms with the stripe on 3 and 4, when the fourth row is lost to leave 17 (*megalops* and *marcianus*). Anteriorly the lateral stripe is on 3 and one-half of 2 and 4, and it seems that this is probably due to a tendency to the loss of the fourth row, for where it is present the stripe is always partly upon it, while when it is absent the stripe is on 2 and 3. The only other form whose range it approaches is *radix*, and if the position of the lateral stripe be considered as a modification of the position which it occupies in this form (on the third and fourth rows), everything seems to point toward *radix* as the nearest relative; for, although *radix* has generally a larger scutellation, we have already seen that in the extreme eastern part of its range, which corresponds very closely with the western limit of *butleri*, a reduction occurs that brings the number of scale rows and labials, at least, exactly to the formulas that characterize *butleri*. I believe that I am justified in concluding, therefore, that this form is a member of the *Radix* group, that its closest relative is *radix*, which it meets on the west.

CONCLUSION.

If the affinities of the different forms as indicated above (fig. 34) be accepted, this group, extending as it does from the Mexican plateau to the Great Lakes region, exhibits a progressive decrease in size and scutellation from the Mexican plateau toward the extreme limits of its range. The reduction is slight in each particular form, but when the extremes are compared with the center it becomes very apparent. Thus, *butleri* and *megalops* in northern Mexico are the extremes in the number of scales in each of the series which I believe to be correlated with size, while at the same time a slight knowledge of these forms is sufficient to show that there is also a striking difference in size between the two. It should also be noted that the areas in which the transitions from one set of scale formulas to another takes place

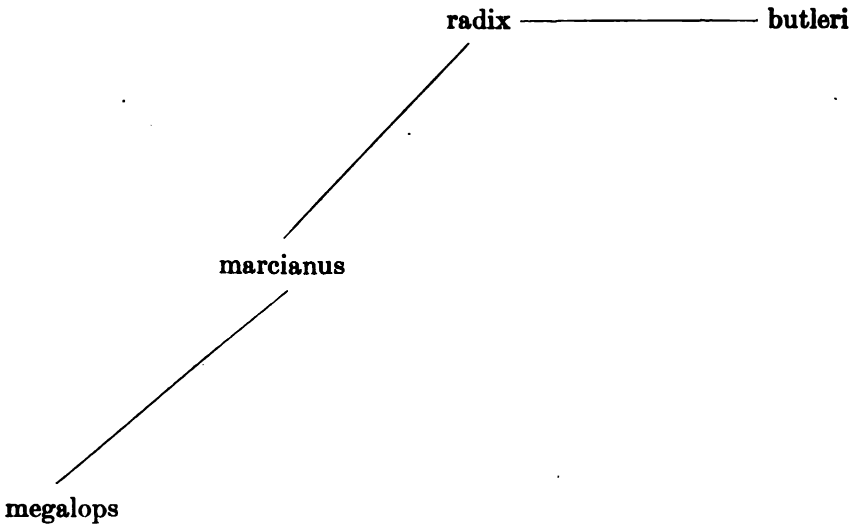


FIG. 34.—PHYLOGENETIC DEVELOPMENT OF THE RADIX GROUP.

lie mostly between the forms, and are apparently very narrow, except between *radix* and *butleri* since *radix* shows a marked tendency toward a reduced formula throughout the prairie region.

If the relationships are as I have described them, it should be noted (1) that in each region of different environmental conditions which it occupies the group is now represented by a different form; (2) that each form is characterized by a smaller scutellation than its neighbor toward northern Mexico, and exhibits its minimum scutellation at some point on the outskirts of its range, where it comes in contact with another form with the scutellation similar to that of the reduced individuals; (3) that the most dwarfed representative of the group is now found in the form farthest removed, geographically and genetically, from the northern part of Mexico.

THE SAURITUS GROUP. (PROXIMUS, SAURITUS, SACKENI.)

PROXIMUS.[a]

Description.—Contrary to most forms in the genus, there is little danger of confusing *proximus* with any other garter-snake. The stripe is always upon the third and fourth rows and the form is long and slender, the tail forming .25 to .37 of the total length. The dorsal scale rows are nearly always 19–17 (in the southern part of the range occasionally 17–19–17) and the labial formula is usually 8/10, only occasionally 8/9 or 8/11, and more rarely 7/10 or 7/9. The ventral scutes vary between 150–179 and the urosteges between 75–125.

In coloration *proximus* closely resembles the other forms of the group. The ground color varies from light olive to brown or black and is never broken up by distinct spots, although a narrow irregular black band is generally found along the stripes in specimens light enough to show it and many of the scales may have black edges and bases. In some of the paler specimens examined the usual two rows of alternating spots are distinct upon the skin, but in by far the majority of specimens these spots are fused more or less, so that the skin between the scales is usually black with numerous white lines irregularly disposed. The stripes may be of a bluish, yellowish, or greenish tint (the dorsal rarely reddish, occasionally brown), and the lateral is in every specimen examined upon the third and fourth rows; the dorsal usually occupies the median and the halves of the adjacent rows, but occasionally covers nearly all of the adjacent rows. The superior labials are always quite pale, occasionally reddish, in color and nearly always lack the black border that is found throughout all of the other groups. The ventral surface is generally bright yellowish, greenish, or bluish, and without or with very small and mostly concealed ventral spots.

Habits and habitat relations.—Very few records of observations upon the habits of this snake can be found. Under the name *Eutænia saurita* var. *faireyi*, Taylor (1892, 322) writes for Nebraska that the food "consists mostly of insects and their larvæ, but also includes fish, frogs, etc." Upon what authority this statement is made we do not know. In regard to three specimens taken at Progreso, Yucatan, Dr. L. J. Cole has written me as follows: "All of the specimens [three] were found in the water (brackish) in the mangrove swamps back of Progreso. One other specimen was seen, and that also was swimming in the water. I saw none of them on land." Cope says (1880, 23) that it is "like the *E. saurita*, aquatic in its habits."

---

[a] *Thamnophis sauritus proximus* (Say), Long's Exped. Rocky Mts., 1823, p. 187. =*Eutænia rutiloris* Cope and *E. faireyi* Baird and Girard.

By far the best account of the habits is that of Ditmars (1907, 220–221):

In habits this snake appeals to the two preceding species [*sauritus* and *sackeni*]. It is very quick in its motions, and appears to be perfectly at home in the water, swimming with agility and extreme grace and diving to the bottom of a pond or stream and there secreting itself among aquatic plants.

Captive specimens are very hardy, and will live indefinitely upon a diet of small frogs or fishes. A number of specimens in the writer's collection were very fond of climbing into a small branch that had been placed in their cage. Here they would coil in a tight cluster, with heads protruding in every direction. Upon the introduction of food they would dart for the prey in frenzied fashion, the lucky individuals thrashing their tails violently as if to distract the attention of their hungry associates from the morsels in the jaws of the former. One of these snakes gave birth to fifteen young on the 24th of August.

While our knowledge of its habits is thus very meager, from what is known of the other forms in this group I believe that, like them, *proximus* will be found to be more aquatic in its habits than most of the other forms of the genus.

Range.—*Proximus* is known to occur on the coastal plain from the eastern coast of British Honduras to the Mississippi River, and to the northward of this plain and west of the Mississippi River in the prairie-plains region and southeastern forest region of North America to about the latitude of the northern boundary of Iowa. The eastern coastal plain in Mexico is a low-lying tract of land bordering the Gulf of Mexico. The climate is hot and humid, the temperatures being tropical and the precipitation excessive. It is the "tierra caliente" of the Mexicans, and is characterized by a rich tropical flora that forms dense jungles. In Texas and Louisiana the coastal plain conditions are similar to those in Mexico. Extensive tide-washed, brackish marshes occur all along the coast, and are accompanied on higher ground by a biota of distinct tropical affinities (Bray, 1901, 102–103; Bailey, 1905, 16–18).

The prairie region of North America has been briefly described. The southeastern forest region, which occupies southeastern United States south and east of the prairie region, is characterized by being the principal area of development of the hard-wood forest; it is the home of *Quercus alba*, *Magnolia acuminata*, *Acer saccharum*, *Fagus americana*, *Liriodendron tulipifera*, *Fraxinus americana*, *Quercus rubra*, and *Hicoria alba*. Transeau (1905) has shown that the region is characterized by a rainfall evaporation ratio of 100–110 per cent and that where this ratio falls to 80–100 per cent the flora merges into that of the prairie region. The southeastern forest region to the south of the prairie peninsula crosses the Mississippi and extends to the eastern limit of the prairie, which, as previously stated, is the western edge of the Ozark highlands and the 98th meridian. *Proximus* enters this region, then, only in its western part.

Specimens of *proximus* with definite locality data have been examined as follows: Progreso and Cozumel Island, Yucatan; Orizaba, Xalapa, and Tuxpam, Veracruz; Matamoras, Tamaulipas; Caderita, Neuvo Leon; Tule Canyon, Dallas, Matagordo, Pecos, Fort Cobb, Brownsville, Wheelock, Helotes, New Braunfels, Austin, Kerrville, San Pedro, San Angelo, Fort McKavett, Devils River, High Bridge, Pecos River, and Fort Stockton, Texas; New Orleans, St. James Parish, Belair, Slidell, Prairie Mer Rouge, Calcasieu Pass, Perry, and Grand Coteau, Louisiana; Greenway, Arkansas; Butler County, Montgomery County, St. Clair County, St. Louis, Missouri; Neosho Falls and Dora, Kansas; Nemaha County, Nebraska; Ames and Des Moines, Iowa; Chicago, Rock Island, Olney, and Mount Carmel, Illinois; Fox River and Racine, Wisconsin.

Boulenger (1893, 214) records specimens from Belize, Honduras.[a] Bailey (1905, 48) gives the following Texas localities: "Brownsville, Lomita Ranch (Hidalgo County), Sycamore Creek, Corpus Christi, and San Antonio River, near San Antonio." Taylor states that he has examined specimens from Nemaha, Saline, and Saunders counties, Nebraska. Branson writes that in Kansas he examined specimens from "Wallace, Douglas, Franklin, Geary, Woodson, Clark, and Shawnee counties." At present we consider all of the Illinois and Wisconsin ribbon snakes as belonging to this form, but, as later stated, more evidence may show that the specimens in this region are not typical. Ribbon snakes occur throughout the former State,[b] and in Wisconsin at least to Racine, and probably farther north, for a single specimen in the U. S. National Museum (No. 731) is labeled "Fox River." No definite Minnesota record has been found, the only record being a single specimen (No. 6179) in the Academy of Natural Sciences of Philadelphia, labeled "Minnesota."

The distribution of this form (fig. 35) is thus in harmony with its aquatic habits. In Mexico it is confined to the coastal plain, being apparently unable to push out from this area. In eastern Texas, however, it encounters the eastern forest, which, as would be expected, apparently furnishes conditions somewhat similar to those of the coastal plain and permits the form to extend its range throughout this environment west of the Mississippi, and even to extend entirely across the prairie region and into the great plains and northeastern forest regions along the streams. Detailed evidence is not at hand that *proximus* is confined to the vicinity of streams in the prairie

[a] Boulenger (1893, 213) also records a specimen from the Atoyac River, Guerrero, and Günther (1894, 132) gives the locality Guatemala, but as these localities are the only ones outside of the eastern coastal plain of Middle America, the data and identification of the specimens should be ascertained with certainty before the range is extended to include them.

[b] H. Garman (1892, 265) gives the following Illinois localities: Chicago, Cook County; Normal, Jersey County; Mount Carmel, Union County.

FIG. 35.—DISTRIBUTION OF THAMNOPHIS SAURITUS PROXIMUS, AS INDICATED BY THE LOCALITY RECORDS.

region, but it is significant that the records in the plains region of Texas are all on rivers that flow eastward into the Gulf of Mexico, while the Kansas, Nebraska, and Iowa records are all in the vicinity of tributaries of the Mississippi. This does not prove conclusively that the form only occurs along streams in the grass-land regions, but since, I believe, it will generally be found closely associated with aquatic habitats even in the more humid and forested parts of its range, it would be surprising if it had a wider distribution in the more arid and treeless parts of the region in which it occurs.

Variation.—*Proximus* exhibits such stability in most of its characters that it should be comparatively easy to detect the nature of such differences as do occur. The number of scale rows is invariably 19–17 throughout the greater part of its range. Indeed, I have observed but a single specimen with a different formula, a specimen (No. 755) from Orizaba, Veracruz, in the U. S. National Museum, which has 17–19–17. It should be noted that this locality is toward the southern limit of the known range of the form.

While the superior labials are somewhat more variable (fig. 36), the variations are still slight. The only variations observed are one

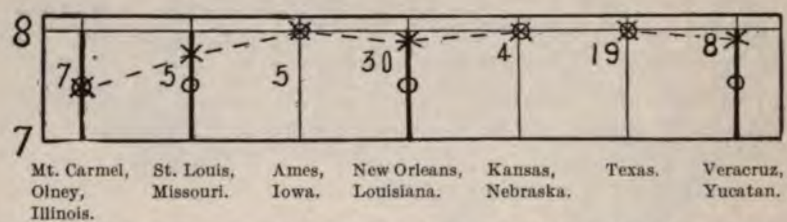


FIG. 36.—DIAGRAM SHOWING THE VARIATION IN THE NUMBER OF SUPRALABIALS IN THAMNOPHIS SAURITUS PROXIMUS.

specimen from Progreso, Yucatan, and two from New Orleans, with 7 on both sides, and one with 7–8 from Belair, Louisiana, one specimen with 7 from St. Louis, Missouri, one with 7–8 and one with 7 from Olney, Illinois, and two with 7 and one with 7–8 from Mount Carmel, Illinois. These are slight variations, but it is significant that the tendency toward a decrease is only shown near the eastern and southern limits of the range. In the case of the number of dorsal scale rows and supralabials the variations are in all cases in the nature of a reduction. In the number of inferior labials, however, we find both an increase and decrease from the usual number, 10. The only two variations observed are 9 and 11, and these occur so rarely and so generally throughout the range that much larger series must be examined before we can hope to detect any geographic differences in this character.

I have stated that *proximus* has from 150–179 ventral plates. It is with reluctance that I give the table below (fig. 37), for I have not specimens to plot the sexes in equal proportions and have

had to base my averages upon all of the specimens available, and I am well aware that the sexual variation is sufficient to render the averages very deceptive in such small series. If care is taken, however, not to attach too much importance to the averages, I believe that the table indicates very plainly that the number of ventral plates is quite constant over the North American portion of the range, and that from the State of Veracruz southward, in Mexico, there is a decrease in the number of scales in this series. This decrease in the southern part of the range is shown not only by averages from the different localities, but also by the fact that the smallest number of ventral plates observed in one hundred specimens examined from the United States is 158 (which occurs in but two specimens from New Orleans), while both specimens from Yucatan, in which the scales

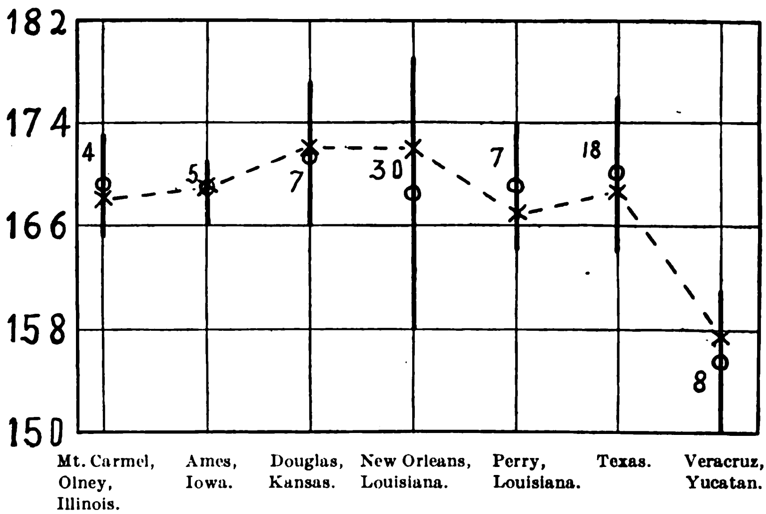


FIG. 37.—DIAGRAM SHOWING THE VARIATION IN THE NUMBER OF VENTRAL SCUTES IN THAMNOPHIS SAURITUS PROXIMUS.

have been counted, is as low as 150. Further than this the maximum number for six specimens from the State of Veracruz is 161, which is lower than any number observed in the United States, with the exception of the two New Orleans specimens. I readily grant that the series of specimens examined is too small to furnish exact evidence of the amount of decrease, but I believe that the records do indicate plainly that a reduction in the number of ventral plates actually takes place in southern Mexico. There is no evidence, however, of a decrease in the number of plates in this series toward the eastern part of the range, comparable to that shown by the supralabials.

As before mentioned the tail in *proximus* is comparatively long; the proportionate length observed varies from .25–.37. Although this variation is considerable, the extremes are seldom reached and the mean length of tail is about .29 or .30 throughout the range.

There is thus no geographical variation shown conclusively in the averages, but it should be noted that the longest tails are found in Louisiana, which may indicate a tendency toward an increase in the length of this organ in this region (fig. 38), while the shortest tails occur in Texas.

Less evidence is at hand regarding the number of subcaudal scutes than is the case in any other series of scales, largely owing to the fact that the tail of many specimens is broken. The extremes are 75–125, an extent of variation which is equaled in no other form in the genus. The averages are not to be relied upon, but it may be seen from the table (fig. 39) that the smallest number occurs in the southwestern part of the range and the largest number in Louisiana. In this case, however, the variation in the number of subcaudal scutes is apparently associated with a variation in the tail length and affords no evidence of the dwarfing shown by the other characters.

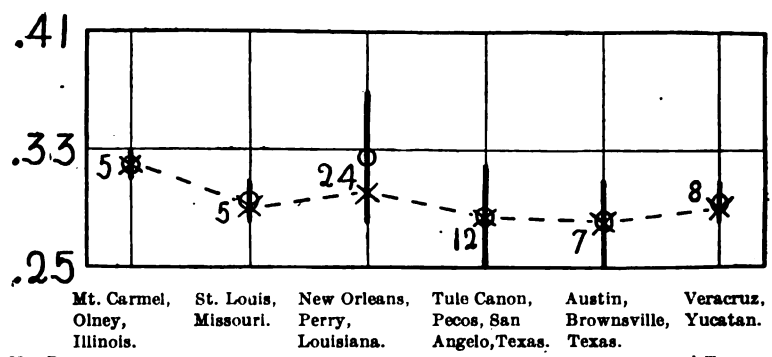


FIG. 38.—DIAGRAM SHOWING THE VARIATION IN THE PROPORTIONATE TAIL LENGTH IN THAMNOPHIS SAURITUS PROXIMUS.

There are few variations in coloration that deserve mention. Occasionally the dorsal stripe is red, but how frequently we do not know, since this color rapidly disappears in alcohol. Occasionally, also, this stripe becomes somewhat obscure, but both of these characters are apparently liable to crop out almost anywhere in the range. The type of *Eutænia rutiloris* Cope is characterized by this obscurity of the dorsal stripe, although the latter is visible throughout the entire length of the body. The only other character (and the principal one) upon which this form was based was the presence of red upon the "superior and inferior labial plates and the first three large gastrosteges." This color is now faded and I have never observed a specimen of *proximus* which exhibited it, but the specimen differs in no other way from the Yucatan specimens of *proximus*, and the character is of too little importance to justify the separation of this specimen from *proximus* (See Ruthven, 1906a).

To summarize the variations in *proximus:*

(1) The dorsal scale formula is 19–17 throughout the range, except in southern Mexico, where a specimen with 17–19–17 has been examined.

(2) The superior labials are 8 over most of the range, 7 only being observed in Yucatan and in general along the Mississippi River.

(3) The inferior labials are usually 10, occasionally 9 or 11, but the variations are so evenly distributed over the range that no geographic differences can be detected in the small series examined.

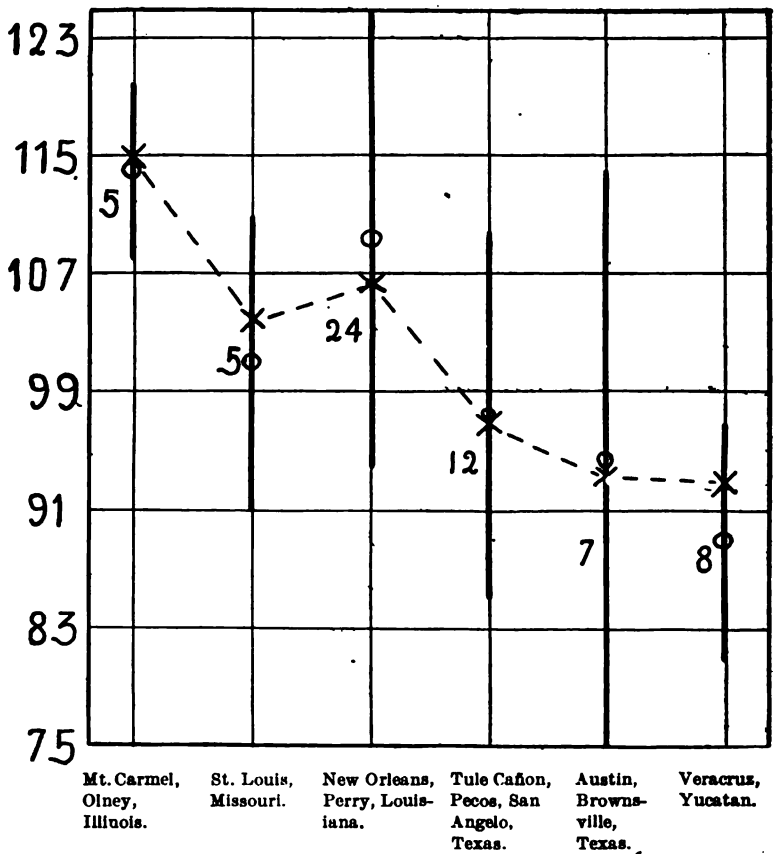


FIG. 39.—DIAGRAM SHOWING THE VARIATION IN THE NUMBER OF SUBCAUDAL SCUTES IN *THAMNOPHIS SAURITUS PROXIMUS*.

(4) The variation in the number of ventral scales is large (150–179), so that from the small amount of material available little reliance can be placed on the averages, but the number (both the averages, maximum and minimum) is strikingly smaller in Veracruz and Yucatan specimens than in the series from North America.

(5) The tail length is very variable, although the mean length for the different localities is quite constant. Southwestern specimens

have the lowest number and Louisiana specimens the highest, which may indicate a tendency toward an increase in tail length in the latter region.

(6) The number of subcaudals as it is correlated with the tail length is variable, so that the averages in the small series are not to be depended upon. But the largest number occurs in Louisiana and the lowest in the southwestern part of the range in harmony with the variations in tail length. Owing to the correlation of the two, the variation in the latter obscures any tendencies toward dwarfing that may exist.

(7) The color variations are too slight to permit of the formation of any geographic races on this basis.

If, then, our material can be relied upon, there is indicated a tendency toward a decreased number of dorsal scale rows and ventral plates in southern Mexico and a decreased number of supralabials in general along the Mississippi River, which if true may be considered as an evidence of dwarfing in *proximus* in these two extremities of the range, while there is an apparent increase in the tail length in Louisiana, as shown by measurements and the number of subcaudal scutes.

Affinities.—If we admit the evidence of the position of the lateral stripe, *proximus* is closely allied to *sauritus*, *sackeni*, and the members of the *Radix* group. Its relation to *sauritus* and *sackeni* is very close, as will be shown later; but its affinities with the *Radix* group are less clear. The chief character which separates it from this group is the decidedly longer tail; but, as shown above, the length of tail decreases in the southwestern part of the range, thus lessening the distinctive value of this character. It is in this region, therefore, that the form most closely resembles the forms of the *Radix* group, and it is here where the closest affinities must be sought. In northern Mexico and western Texas it differs markedly in scutellation from the representatives of the *Radix* group (*megalops* and *marcianus*) only in the smaller number of scale rows (19–17 instead of 21–19–17). This difference, as already seen, is only of racial importance, and as the formula is but one step less than that of the *Radix* group in this region, there can be no objections on this score to the direct deviation of *proximus* from *marcianus* or *megalops*. On the other hand, the range of *proximus* overlaps the range of *marcianus* to a considerable extent without effecting the distinctiveness of either type, which argues against a direct relationship between the two forms, and the same is true of *radix*.

Concerning *megalops*, however, the case is different. The ranges of the two forms come close together in Mexico, but do not overlap, *megalops* inhabiting the plateau and *proximus* the coastal plain. The tail length in *proximus* is also less different from *megalops* than

from any other form in the *Radix* group, both owing to the somewhat greater length of tail in *megalops* and to the shorter tail in *proximus* in northern Mexico. Since the scutellation is practically the same in the two forms, except that the dorsal scale formula in *proximus* is slightly smaller, it may be that *proximus* is a direct relative of *megalops* which has pushed eastward into the eastern coastal-plain region of northern Mexico, and from here southward and northward into the regions which it now occupies. However, it is quite distinct from *megalops* at the present time, in the long tail and more slender body, and it is to the northward that we must look for its closest relatives.

SACKENI.[a]

Description.—This beautiful snake has received but little attention from herpetologists and is represented in collections by but few specimens. The scutellation may be defined as follows: Dorsal scale rows, 19–17; supralabials, 8; infralabials, 10; ventral plates, 154–171; subcaudal scutes, 109–134; tail length, .32–.38. The coloration is similar to light specimens of *proximus*, the lateral stripe being on the third and fourth rows (yellowish or greenish), the ground color usually a shade of brownish olive, and the belly and labials light and generally unmarked. As in *proximus*, the ventral spots are usually absent, but not always, and the lateral spots are generally fused irregularly, although occasionally distinct in the usual two rows between the stripes; even when distinct on the skin, however, they are not represented on the scales except by a narrow black border along the dorsal, and occasionally the lateral stripes. The lateral stripe is always distinct, but the dorsal is generally obscure and often entirely wanting; when present, it covers all or nearly all of the median three rows.

Habits and habitat relations.—*Sackeni* is a very interesting snake. In the length of tail and slender body it represents the extreme in the group and genus, and with the attenuated form is coupled an agility of movement that we doubt is exceeded in any other garter-snake. While comparatively little is written upon its habits, there is slight doubt but that, like *proximus*, *sackeni* is quite aquatic in its habits. Thus, Ditmars (1907, 219–220) writes, "In habits this species is very similar to the ribbon snake [*sauritus*]. It is very aquatic, and is seen frequently sunning on the branches of bushes that overhang the water, into which it drops when alarmed." Loennberg (1894, 329) remarks of the specimens obtained by him in Florida, "All were caught in the grass in wet places." Personally I have been able to make few observations on the habits of this form. During the summer of 1905 I reared two broods which were born on July 19. The young resembled those of other forms in habits except for

[a] *Thamnophis sauritus sackeni* (KENNICOTT), Proc. Acad. Nat. Sci. Phila., 1859, p. 98.

their greater agility. Like the adults, they steadily refused earthworms, but at the age of three days took to the water and captured and ate live minnows voraciously. Their manner of catching fish was interesting. Dropping or climbing into the basin they would rush about, mouth open, until they encountered a fish, when they would rush out of the water, lashing their tails energetically, carry the fish to a corner and proceed to devour it. The sense of sight seemed to be depended upon but little in capturing fish, and dead ones were eaten apparently as frequently as live ones.

Range.—As at present known the range of *sackeni* is confined to the southern part of the coastal plain, in southern Mississippi and Florida. This physically recent feature with its low altitude (nowhere more than a few hundred feet above sea level) is characterized by scores of stagnant rivers, lakes, lagoons, and swamps. The temperature and humidity are high and the rainfall-evaporation ratio exceeds 110 per cent (Transeau, 1905). The vegetation is rich, and consists of such forms as white cedar, sweet bay, magnolia, tupelo gum, swamp cottonwood, cypress, *Quercus texana*, etc., in the swamps, and several species of pines on the higher ground.

Specimens of true *sackeni* have been examined from the following localities: St. Johns River, Volusia County, Georgiana, Palatka, Orange Hammock, Kissimee River, Kissimee, Enterprise, Lemon City, Little Sarasota Bay, Clear Water, Pensacola, Marion County, Gainesville, and Orlando, Florida, and Bay St. Louis, Mississippi. As far as I have been able to find, the form has never been recorded outside of Florida, although Ditmars (1907, 219) states that it is distributed in the "coast regions of South Carolina and Georgia; Florida generally." Certainly typical *sackeni* may be expected to occur somewhat north of the latitude of the northern boundary of Florida, but in this general region it comes in contact with *sauritus* and the status of the two forms in the intermediate region must be examined before the northern boundary of *sackeni* can be even approximately fixed. I must confess to have examined but very few specimens from the debatable region, but the fact that *sauritus* specimens from the coastal plain from North Carolina northward show a much closer affinity to *sackeni* than those from central Alabama would seem to indicate that true *sackeni* pushes farther up the Atlantic coast than in the interior, possibly into Georgia and South Carolina, as Ditmars indicates, which might also be expected in view of its more aquatic habits and its association with the coastal plain conditions throughout the greater part of its range. The range as known at present is indicated on the accompanying map (fig. 40).

Variation.—The dorsal scale formula is easily disposed of, for in every specimen examined it is 19–17. The labial formula is nearly

as constant, although the diagram (fig. 41) indicates that there is some variation in the number of superior labials. Thus, while 8 supralabials is the rule throughout most of the range, 7 occurs in the

FIG. 40.—DISTRIBUTION OF THAMNOPHIS SAURITUS SACKENI, AS INDICATED BY THE LOCALITY RECORDS.

western (southern Mississippi and western Florida) specimens, although in what proportion it is impossible to estimate, as very little material is available from this region. The inferior labials are 10 in

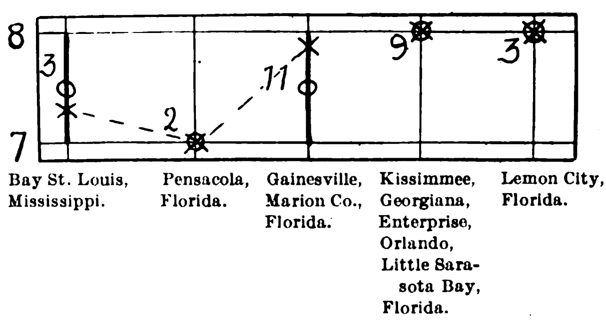


FIG. 41.—DIAGRAM SHOWING THE VARIATION IN THE NUMBER OF SUPRALABIALS IN THAMNOPHIS SAURITUS SACKENI.

every individual examined. The number of ventral plates is rather variable (fig. 42). The extremes are 154–171, the average number lying between 158–166. There is no definite geographic variation in

this trait indicated by the material examined. The tail length is strikingly constant for this group, which may be in part but not entirely explained by the small amount of material; the length exceeds that of any other form in the genus, the extremes being .32–.38, the average between .33–.36 (see fig. 43). As is to be expected from

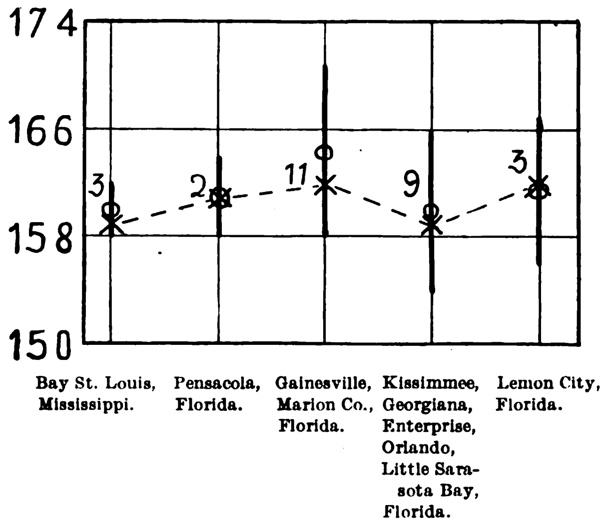


FIG. 42.—DIAGRAM SHOWING THE VARIATION IN THE NUMBER OF VENTRAL SCUTES IN THAMNOPHIS SAURITUS SACKENI.

the length of the tail, the number of subcaudal scutes also exceeds that of any other form. As shown by the diagram (fig. 44), the extremes are 109–134 and the averages for the different localities

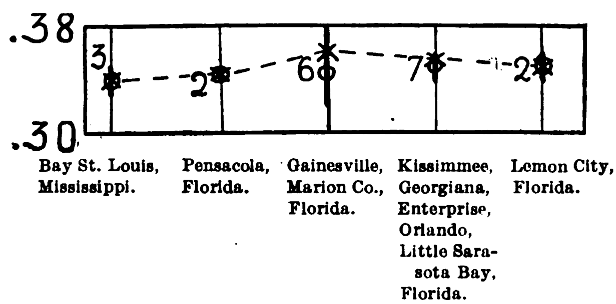


FIG. 43.—DIAGRAM SHOWING THE VARIATION IN THE PROPORTIONATE TAIL LENGTH IN THAMNOPHIS SAURITUS SACKENI.

between 120 and 127. Here again no geographic variations can be detected.

As is generally the case in the forms of the *Sauritus* group, there is little variation in coloration in *sackeni*. The usual variation of light to dark in the ground color is present, the lighter individuals being a

light greenish olive, the darker ones often dark brown. The lateral stripe is always present, but, as stated above, the dorsal stripe is usually obscure. Still, although *sackeni* is usually described as having the dorsal stripe obscure or wanting, this is decidedly not always the case, for in some of the specimens in the U. S. National Museum from Georgiana, Florida, it is not only well defined but also of a bright color. This variation is not geographic, but may occur in individuals apparently anywhere in the range.

Affinities.—Fortunately there is little difficulty in determining the affinities of this form. The position of the lateral stripe on the third and fourth rows and the length of tail at once proclaims it a member

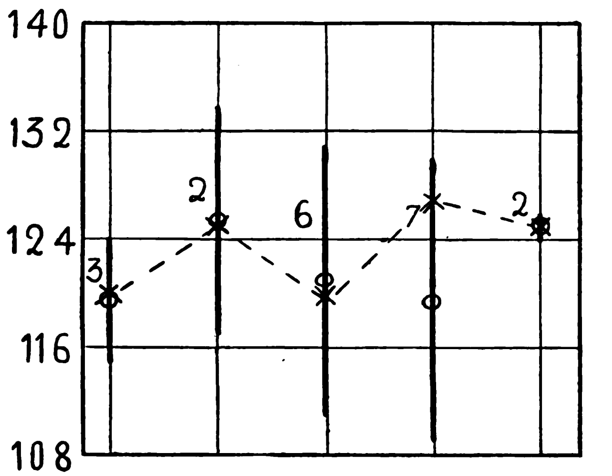


FIG. 44.—DIAGRAM SHOWING THE VARIATION IN THE NUMBER OF SUBCAUDAL SCUTES IN THAMNOPHIS SAURITUS SACKENI.

of the *Sauritus* group. It differs from *proximus* only in the greater average length of tail and the consequent larger number of subcaudal scutes, a smaller number of ventral plates, and the frequent obscurity of the dorsal stripe. A knowledge of the variations, however, shows that these differences are slight, for (1) the dorsal stripe in *proximus* is occasionally obscure, (2) the length of tail and number of subcaudal scutes in *proximus* apparently increases, while the number of ventral plates decreases in southern Louisiana to approximate the condition in *sackeni*. As a matter of fact there is no reason to believe that the two forms do not intergrade perfectly in southern Mississippi. It should be borne in mind, however, that although *sackeni* has a longer tail and more subcaudal scutes than *proximus* it apparently

tends to be more dwarfed, as shown by the reduced number of ventral plates and possibly by a tendency toward 7 instead of 8 superior labials. Its relation to *sauritus* will be considered later.

SAURITUS.[a]

Description.—This is the best and longest known form in the group. The lateral stripe is upon the third and fourth rows throughout the length of body. The tail is longer than in *proximus*, but not as long as in *sackeni*, the length varying from .29 to .36. The scutellation may be described as follows: 19–17 dorsal scale rows; 7, occasionally 6 or 8, superior labials; 10, occasionally 9, rarely 11, inferior labials; ventral plates, 150 to 172; subcaudal scutes, 87–137. The ground color above is usually chocolate brown, but varies from light olive brown to black. Michigan specimens are quite frequently black, with the exception of the keels of the scales, which are light brown. The stripes are nearly always bright and conspicuous, the dorsal generally having an orange tint, the laterals paler and of a greenish cast. The labials are usually without black blotches and the lateral spots are seldom distinct, although they are not always entirely fused to the total abolition of the light (whitish) interspaces. As in *proximus* and *sackeni*, the ventral spots are generally absent.

Habits and habitat relations.—Like the other members of the group, *sauritus* seems to be more than ordinarily aquatic in its habits, but apparently less so than either *proximus* or *sackeni*. In Michigan we have generally found it about the margin of ponds and streams in damp woods. It is somewhat of a climber, and is occasionally found in bushes, several feet from the ground. When pursued it glides through the pools and herbage at an astonishing rate, and does not hesitate to take to water and conceal itself among the water plants, but it generally remains near the surface, and we have never observed it dive to the bottom like a natricid snake. There are numerous short notes in the literature, to the effect that *sauritus* prefers damp situations.

Ditmars (1907, 217–219) states that it feeds on salamanders, tadpoles, frogs, and fish, but, like *sackeni*, refuses earthworms. Two other writers, Atkinson (1901, 151) and Surface (1906, 142–143), record insects in stomachs examined. The latter gives the following as making up the stomach contents of Pennsylvania specimens: Earthworms, spiders, insect fragments, ants, *Plethodon cinereus*, *Spelerpes bilineatus*, *Hyla versicolor*. It should be noted that the insects may have been contained in the stomachs of the frogs and salamanders. The number of young is comparatively small; we have counted the embryos in a few specimens, and they seem to average about a dozen.

---

[a] *Thamnophis sauritus* (LINNÆUS), Syst. Natur., XII, p. 385.

Range.—As is well known, *sauritus* is found in the forest region of eastern United States. Characterized by mild temperatures and a plentiful rainfall, this region supports an abundant arboreal vegetation that extends to the northward to the limit of tree growth and to the westward to the prairies. It includes two types of biota, the northeastern conifer, and southeastern deciduous forest types. The northeastern coniferous forest is characterized by such trees as the larch, balsam, white and black spruce, white and red pine, etc., and centers in the Laurentian highlands, while the southeastern deciduous forest type possesses the sugar maple, white ash, beech, and several oaks, and centers about the southern Appalachians. These two types of biota intergrade for a considerable distance in Michigan, New York, New Hampshire, and Vermont, although the higher parts of the Appalachians carry an outlying tongue of the northeastern coniferous type as far south as Georgia. The deciduous forest reaches its greatest development in southeastern United States and, as already noted, grades into the prairie through the so-called "fringe forest," which covers all of Ohio and Indiana, and margins the prairie in Illinois, Missouri, southeastern Kansas, and east-central Texas.

Specimens of *sauritus* have been examined from the following localities: Roscommon County, Alma, Olivet, Washtenaw County, Lapeer County, Rawson Lake, and Lansing, Michigan; Waterloo, Lake Maxinkuckee, Veedersburgh, Lebanon, and Wheatland, Indiana; Medina County, Toledo, and Oberlin, Ohio; Delaware County, Darby, Londongrove, Allegheny County, Carlisle, and Indiana County, Pennsylvania; Haddonfield and Pleasant Point, New Jersey; Tioga County and Highland Falls, New York; Middletown, Connecticut; Wellesley, Sherborn, Woods Hole, and Lancaster, Massachusetts; Auburn, Maine; Chepachet Island, Rhode Island; Arlington, Virginia; Laurel, Maryland; Washington, District of Columbia; Avoca, Summerville, and Wilmington, North Carolina.

These localities represent the entire range of the form, as at present known, and it is not necessary to cite the numerous records in the literature. From these records it is evident that, if the form is properly defined, the range is closely confined to the southeastern forest region, north of Florida and east of the Mississippi River and the prairie peninsula. The northernmost localities known to me are Roscommon County, Michigan, Norway and Auburn, Maine, which would indicate, as is undoubtedly the case, that the form occurs in extreme southern Canada. It will thus be seen that *sauritus* does not enter the northeastern forest proper, but pushes well into the intermediate region between this forest and that of southeastern North America.

The western and southern limits are not definitely known. This is due in large part to the want of specimens from the region of these boundaries. As will be shown later, however, the western limit may probably be given in general as the Indiana-Illinois boundary and western Kentucky, Tennessee, and Mississippi (fig. 45).

Variation.—From the list of localities from which specimens of *sauritus* have been examined it might seem that a considerable amount

FIG. 45.—DISTRIBUTION OF THAMNOPHIS SAURITUS, AS INDICATED BY THE LOCALITY RECORDS.

of material was available for the study of this form. Unfortunately, however, none of these localities are represented by more than about a dozen specimens, the usual number being one to four. Even after combining the records from neighboring localities, the data is still insufficient to denote more than general conditions.

As in the case of *sackeni*, the dorsal scale formula in no specimen examined departs from 19–17.[a] The labial formula, on the other

[a] Compare p. 35.

hand, is more variable than in either of the other forms in the group. An examination of the diagrams (figs. 46–47) will show that the variation in both series consists of a loss or an addition of one scute from the more constant number 7/10. The average number of supralabials is generally a little above 7, showing the comparative

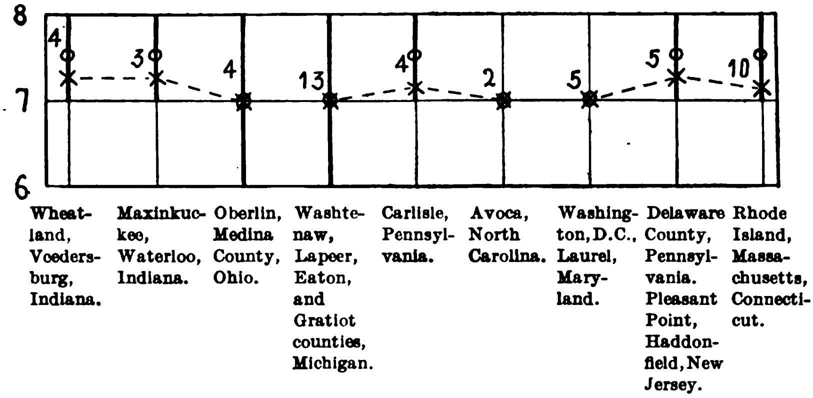


FIG. 46.—DIAGRAM SHOWING THE VARIATION IN THE NUMBER OF SUPRALABIALS IN THAMNOPHIS SAURITUS.

rareness of specimens with 8 or 6 scutes in this series. No definite geographic differences can be discovered in the material examined. In the case of the infralabials the conditions are exactly reversed in that, while the variations are so slight as to disturb the averages

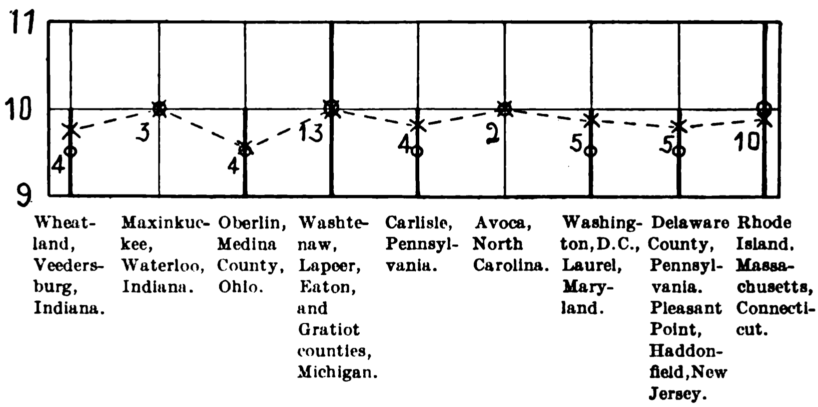


FIG. 47.—DIAGRAM SHOWING THE VARIATION IN THE NUMBER OF INFRALABIALS IN THAMNOPHIS SAURITUS.

but little, the differences that do occur are mostly by way of a reduction to 9, so that the averages run a little below 10.

As in the other ribbon snakes, the variation in the number of ventral plates is considerable. In the material examined the extremes are 150 and 172. The table (fig. 48) will show how the

variations are distributed. While this diagram is very subject to error, owing to the small number of specimens, it is interesting to note that specimens from eastern localities have apparently a smaller number of ventral scutes than those from Michigan, Ohio, and Indiana, and while larger suites of specimens will undoubtedly

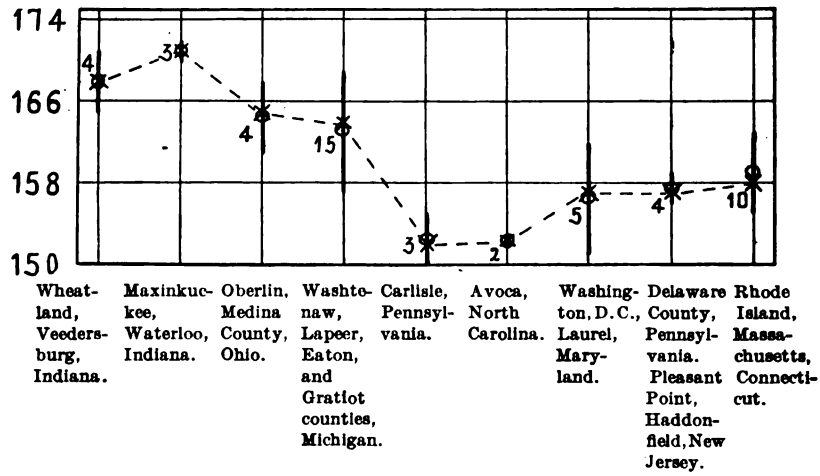


FIG. 48.—DIAGRAM SHOWING THE VARIATION IN THE NUMBER OF VENTRAL SCUTES IN THAMNOPHIS SAURITUS.

change the averages, we believe that the difference is a real one. The length of tail (fig. 49) is apparently quite constant. The extremes are .29 to .36, the average about .33, and while the average can not be relied upon, it may be significant that the tail length is

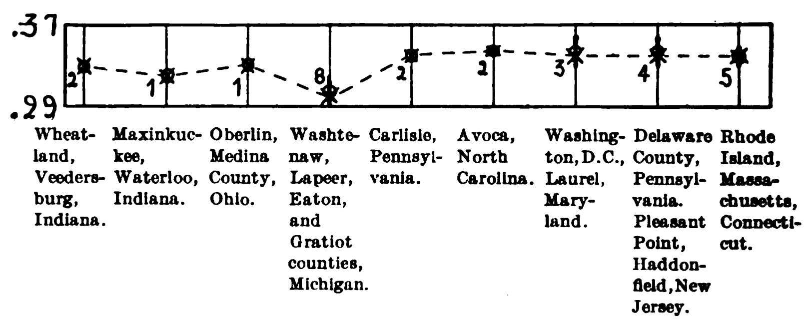


FIG. 49.—DIAGRAM SHOWING THE VARIATION IN THE PROPORTIONATE TAIL LENGTH IN THAMNOPHIS SAURITUS.

somewhat greater in eastern localities. This is shown better in the number of subcaudal plates (fig. 50). Thus, in Ohio, Michigan, and Indiana the extreme number of subcaudal plates is 87 and 121, the averages between 100 and 117, while along the coastal plain the extremes are 103 and 137, the averages between 115 and 120. (No

differences in color have been observed which are evidently geographic.)

If the data plotted can be depended upon to reveal the actual state of variation, the form may thus be divided into two sections upon the basis of the scutellation and tail length, i. e., a trans-Allegheny section characterized by a larger number of ventral scutes, a shorter tail and fewer subcaudal scutes, and a coastal plain section characterized by a fewer number of ventral plates, a longer tail and more subcaudal scutes.

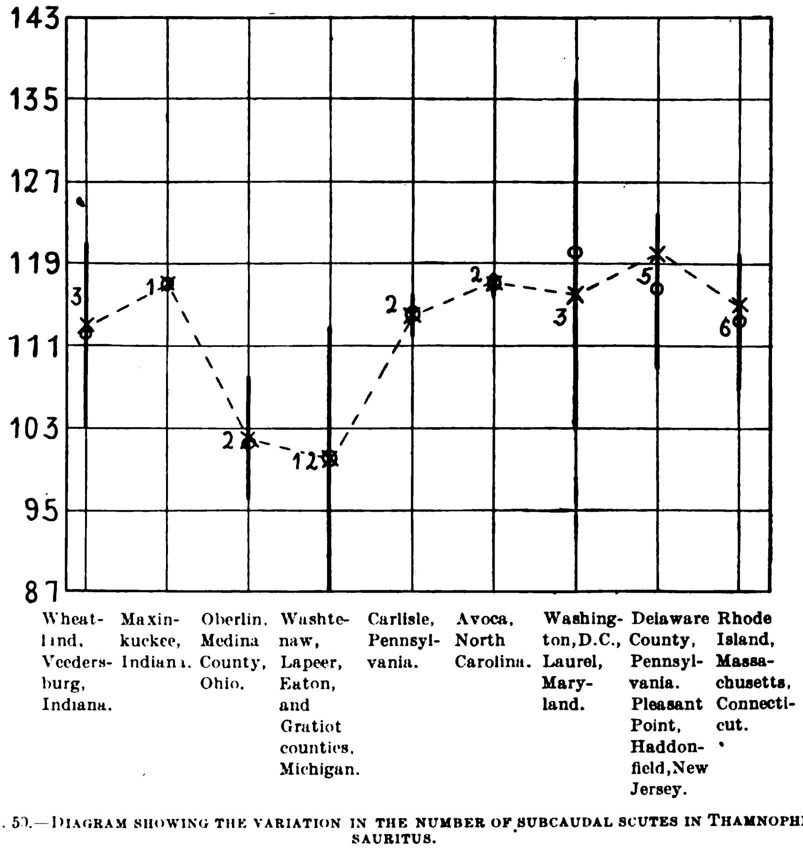


FIG. 59.—DIAGRAM SHOWING THE VARIATION IN THE NUMBER OF SUBCAUDAL SCUTES IN THAMNOPHIS SAURITUS.

Affinities.—The position of the lateral stripe (on the third and fourth rows) and the long tail justifies us in placing *sauritus* in the same group with *sackeni* and *proximus*. As has been shown, it meets the range of *sackeni* in the latitude of northern Florida and that of *proximus* along the eastern boundary of Illinois and in western Kentucky, Tennessee, and Mississippi. Specimens from the intermediate region along the common boundaries of the three forms remain to be examined, but I believe that there can be no doubt that *sauritus* intergrades perfectly with both *sackeni* and *proximus*.

Sauritus differs from *sackeni* principally in its generally fewer number of labials, subcaudals, and ventral scutes and the shorter tail, and from *proximus* in the fewer labials and ventral scutes and greater number of subcaudals and slightly longer tail. A comparison of the tables, however, will show that these differences are not sharp. Thus, while the usual number of labials in *sackeni* are 8/10, the formula 7/10 is not rare, while in *sauritus* the general formula 7/10 is not infrequently replaced by 8/10. This suggests that the two forms may intergrade in this trait, although the data are not sufficient to establish this geographically.

It has previously been noted that *proximus* specimens from the eastern part of the range show an apparent tendency toward a reduction in the number of supralabials from 8 to 7, the average number for Illinois specimens being almost identical with the average for Indiana specimens of *sauritus*. Very similar conditions exist in the case of the other characters. In coastal plain specimens of *sauritus* the extremes of variation in the number of ventral scutes are quite close to those of *sackeni*, although the averages are somewhat lower. In southern Michigan, Ohio, and Indiana, however, the number of scutes in this series is apparently higher than in either the coastal plain specimens of *sauritus* or *sackeni*, which brings the form in this region so close to *proximus* specimens from Illinois, eastern Iowa, and St. Louis that the character is useless as a distinguishing one. Again, the greater number of subcaudal scutes and the tail length in coastal plain specimens of *sauritus* approximate the conditions in *sackeni*, while the shorter tail and fewer subcaudals in western specimens of *sauritus* are almost identical with eastern specimens of *proximus*.

It seems very evident from this digest of the variations in the three forms (1) that the form *sauritus* intergrades both with *sackeni* and *proximus;* (2) that the longer tail, more numerous subcaudals, and fewer ventrals relate the specimens of *sauritus* from the eastern coastal plain more closely to *sackeni*, while the shorter tail, fewer subcaudals, and greater number of ventral scutes relate the interior specimens directly to *proximus*.

I suggest, then, that the form now known as *sauritus* has had a double origin, i. e., the coastal plain section from *sackeni* and the trans-Allegheny section directly from *proximus*. This is what we might expect, for the fact that the ribbon snakes are so eminently adapted to the coastal plain conditions would favor the rapid invasion of the eastern coastal plain from Florida, while the Appalachian system would prove more of a barrier to such an aquatic form than to a more terrestrial one, and permit the section from beyond the Mississippi to push into the region west of the Appalachians. However this may be,

it should be noted that *sauritus* as a form has, exclusive of the dorsal scale rows, a smaller scutellation generally than either *sackeni* or *proximus*.

CONCLUSION.

In the foregoing pages we have endeavored to give the results of a study of the characters, habitat relations, variations, and affinities of the three forms, *proximus*, *sackeni*, and *sauritus*, which are apparently united into a single group by the position of the lateral stripe upon the third and fourth rows and the long tail. The evidence seems to indicate that the three forms intergrade perfectly with each other, but even though the evidence may be considered too slight to prove this, I believe it to be indisputable that the closest relationships of these forms are along the common boundaries (fig. 51).

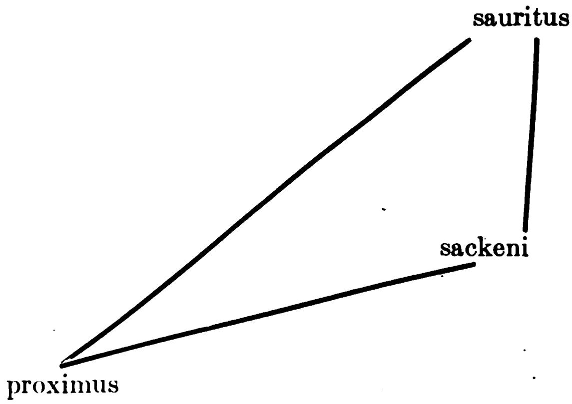


FIG. 51.—PHYLOGENETIC DEVELOPMENT OF THE SAURITUS GROUP.

Of the three forms, *proximus*, in northern Mexico and Texas, possesses the maximum scutellation (exclusive of the subcaudal plates) and *sauritus* the minimum, *sackeni* possessing an intermediate number. The decrease takes place gradually from *proximus* to *sackeni* to the coastal plain section of *sauritus* and from *proximus* directly to the trans-Allegheny section of *sauritus*. The tail length and number of subcaudal plates increase somewhat from *proximus* to *sauritus* and markedly from *proximus* to *sackeni*, apparently decreasing again in the coastal plain specimens of *sauritus*, thus approaching the shorter-tailed conditions in the trans-Allegheny section of the latter. It must also be stated that according to my observations *proximus* specimens attain to the largest size.

The center of origin of this group will be discussed later (see p. 187), but it may be stated here that I believe the center of dispersal to be in northern Mexico. If the group did originate in this region the explanation for its present distribution would seem clear. Being rather aquatic in its habits, we would expect the original stock to

adhere quite closely to the coastal plain in Mexico, but in the United States it has apparently been able to push out along the rivers, the westward trend of the streams permitting it to cross the plains and prairies, the Mississippi to extend its range well to the northward. East of the Mississippi River the group has been able to extend over all of eastern United States, the coastal plain leading one section from the coastal plain of Texas and Louisiana into Florida and from here up the Atlantic coast, the other section pushing into the trans-Allegheny States from the Mississippi Valley. It should be noted again in this connection that a reduction in scutellation and size in the group takes place away from northern Mexico, both to the south and east (the extremities of the range of the group), and that the area between the forms, in which a difference in scale formulas is accomplished, is in every case narrow.

THE ELEGANS GROUP.—(ANGUSTIROSTRIS, MELANOGASTER, SCALARIS, PHENAX, HAMMONDI, ELEGANS, ORDINOIDES.)

ANGUSTIROSTRIS.[a]

Description.—If in assembling these forms of garter-snakes I have distinguished a natural group I should be able to support my position by pointing out the lines of relationship between the component forms. As in the *Radix* group, I begin with the forms on the Mexican table-land, one of which (*angustirostris*) also possesses the maximum scutellation for the group. Apparently not over a dozen specimens of this form have been recorded, although it is probably not rare in the region where it is found.

In appearance it is one of the most peculiar forms in the genus. The stripes are usually entirely wanting, but the laterals are occasionally faintly in evidence on the second or second and third rows, and the dorsal for a short distance anteriorly on the median row. The scutellation in the specimens examined is as follows: Dorsal scale formula, 21–19–17, with occasional variations to 21–23–21–19–17 and 19–21–19–17; supralabials, 8 to 9; infralabials, 10–11 (9 in one instance); preoculars, usually 3; postoculars, 3 to 4; subcaudals, 65 to 83; ventrals, 153–163; tail length, .235 to .256. The eye is generally cut off from all but one labial by the anterior prolongation of the lower postocular, but this is not always the case.

The color above is usually dark olive brown, with six rows of dark brown spots on the scales, distinct in the young, but indistinct or obsolete in the adults. The head is also unicolored above in the adults, while in the young it is finely speckled with lighter. Each upper and lower labial is margined with a triangular patch of brown

---

[a] *Thamnophis angustirostris* (KENNICOTT), Proc. Acad. Nat. Sci. Phila., 1860, p. 332. This form includes *Atomarchus multimaculatus* COPE and *Chilopoma rufopunctatum* COPE.

bordered with darker. Belly greenish or bluish ash, marked with numerous small black spots, and a bar at the base of each ventral, which is usually prolonged outward to form a more or less irregular median ventral band. Throat yellow.

Habits and habitat relations.—Little data is available on the nabitat relations of this snake, but it is undoubtedly particularly aquatic in its habits. Thus, Cope (1883b) states of the San Francisco River specimen obtained by him:

> The only specimen of this species which I have seen living was taken in a seine net with which I was fishing near the bank of the San Francisco River. It dove into the net, seeking the bottom of the water as a place of concealment, as is the habit of *E. melanogaster* and contrary to that of *E. saurita* and *E. macrostemma*, which swim preferably on the surface, seeking concealment under banks.

Range.—As at present known, this form is confined to the northern part of the Mexican plateau (above northern Durango) and the proplateau region in southwestern New Mexico and southeastern Arizona (fig. 52). The conditions of this habitat have already been described (p. 46). Specimens have been examined from Chihuahua and San Andreas, Chihuahua; Parras, Coahuila, and Coyotes, Durango, but it occurs also in southern Arizona, as Cope (1883b, 1300–1301) records a specimen from the San Francisco River in southern New Mexico, and the type of *rufopunctatum* came from "southern Arizona."

Variation.—Very few facts are available for the study of variation in this form. The dorsal scale rows are very constantly 21–19–17. A single specimen from San Andreas, Chihuahua, has 21–23–21–19–17, and another from Chihuahua, Chihuahua, has 19–21–19–17. No geographic variation is discernible in this character in the material at hand, the more northern and southern specimens all having generally 21–19–17 rows. The same thing is true of the labial scutes, the formula being 8/10 or 8/11, or 9/10 or 9/11, but with no certain differences in those from different localities, although only those from Chihuahua have 9 in the superior series.

In regard to the ocular scales the conditions are somewhat different. In all of the specimens examined from the vicinity of Chihuahua, Chihuahua, there are three preoculars and three or four postoculars, and the eye is excluded from the posterior subocular labial by the lower postocular, but in those from northern Durango and southern Coahuila the formula is 2–3 or 1–3 and the eye is fairly in contact with two labials. Similarly the type of *rufopunctatum* from "southern Arizona" is said to have had one preocular on one side and two on the other, as well as three and four postoculars, with the eye in contact with two labials. But little idea can be obtained as to the range or mean in the variations of the ventral and subcaudal scutes. In the material examined the males have in general 162–166 ventrals and 73–83 subcaudals, the females 153–159 ventrals and 64–69 sub-

FIG. 52.—DISTRIBUTION OF THAMNOPHIS ANGUSTIROSTRIS AS INDICATED BY THE LOCALITY RECORDS.

caudals. The tail length varies from .22–.256, the average of males and females combined being about .225.

It is needless to point out that these figures can not be relied upon to furnish more than a general idea of the scutellation and proportions in this form. Still, the more constant characters seem to indicate (1) that in the vicinity of the city of Chihuahua the number of dorsal scale rows, oculars, and possibly the labials reach the maximum for the form, and also for the group and genus; (2) that toward the northern and southern limits of the range the number of oculars, especially the preoculars, tends to decrease; (3) that the orbit, which in every specimen from the vicinity of Chihuahua, Chihuahua, is separated from all but one labial by the inferior postoculars, becomes fairly in contact with two in the northern[a] and southern parts of the range.

Affinities.—In the most southern localities from which it is known *angustirostris* comes in contact with *melanogaster*. These forms always resemble each other closely in that both are characterized by a slender head, small eye, mostly 8 supralabials and 10 infralabials, nearly the same number of ventral scutes, more than one preocular, the absence of the dorsal stripe, and the presence of a dark median ventral band. The differences between them are that in specimens of *angustirostris* there are generally well-defined blotches on the labials, the lateral spots are usually in evidence, the lateral stripes generally obsolete, the eye usually in contact with but one labial, and not less than 21–19–17 scale rows. While in *melanogaster* there are no large blotches on the labials or evidence of lateral spots, the lateral stripe is often present, the eye is in contact with two labials, and the dorsal scale formula rarely exceeds 19–17.

It may be seen from this that the differences between the two forms are slight except in two particulars, the segregation of the eye from the second subocular labial and in the dorsal scale formula. In regard to the former trait we have already shown that in the region which these forms hold in common *angustirostris* becomes exactly like *melanogaster* in the fact that the eye is in contact with two labials. It will also be shown in the consideration of *melanogaster* that the number of rows of dorsal scales tends to become as in *angustirostris* (21–19–17 or 19–21–19–17). The evidence, therefore, favors strongly the view that the two forms intergrade in northern Durango and southern Coahuila, so that it must be adopted for the present, although the relationships of the two forms in the intermediate region should

[a] In the type of *multimaculata* (from the San Francisco River) the eye is in contact with but one labial, but in *rufopunctatum*, as already mentioned, it is bounded by two.

be carefully investigated before any definite conclusion can be reached.[a]

Elsewhere in its range *angustirostris* is not known to meet any similar form, but to the northward the known limit of its range approaches that of one which is strikingly like it in many respects. I speak of *T. hammondi* (Kennicott). The points of similarity between these forms will be discussed when *hammondi* is considered in detail.

MELANOGASTER.[b]

Description.—I have already stated that this species resembles *angustirostris* so closely as to suggest strongly a near relationship. The head is slender and the eye small. Lateral stripes usually present, and confined to the second row of scales. The dorsal stripe is usually wanting, but may be present on the median row. Dorsal scale formula, 19–17; the labials, 8/10 (very rarely 7/10, 8/9, or 8/11); oculars, usually 2–2 or 2–3, occasionally 2–4 or 3–3; ventral plates, 139–158; subcaudals, 49–76; proportionate tail length, .19–.26. The color above is uniformly very dark brown without distinct spots. Both the dorsal and lateral stripes are indistinct when present. Belly greenish slate or yellowish ash, with a black bar on the base of each ventral, which is prolonged in the middle to form a median ventral band. Throat and supralabials dark yellow.

Habits and habitat relations.—Like its northern relative, *angustirostris*, *melanogaster* is apparently quite aquatic in habits. The following account of its habits at the City of Mexico, recorded by Cope, has already been quoted in the discussion of the habits of *megalops*.

[a] Kennicott's type of *angustirostris* (Parras, Coahuila) is not exactly typical of the northern form, as the eye is fairly in contact with two labials; but while it is thus somewhat intermediate between the northern and southern forms, it is much closer to the former, as shown by the coloration and the possession of 21–19–17 scale rows, thus making it entirely fair to give this name to the form.

[b] *Thamnophis angustirostris melanogaster* (PETERS), Monats. König. Preuss. Akad. Wissen. Berlin, 1864 (1865), pp. 389–390. Includes *Tropidonotus baronis-mülleri* TROSCHEL, *Tropidonotus mesomelanus* JAN, and *Regina mesomelaena* COPE. The fact that Peters states that "Diese Art ist bereits von Wiegmann (*Preisverzeichniss der Säugethiere, Vogel, Amphibien, Fische, und Krebse, welche von Hrn. Deppe und Schiede in Mexico gesammelt worden, Berlin, 1. Sept., 1830;* wieder abgedruckt in Cabanis Journal fur Ornithologie, 1863, p. 54) benannt und unter dem obigen Namen versandt und verkauft worden" has led Cope to credit this name to Wiegmann. Inasmuch, however, as Peters first described the species, he should be held responsible for the name, for Article 21 of the International Code distinctly says that "The author of a scientific name is that person who first publishes the name in connection with an indication, a definition, or a description, unless it is clear from the contents of the publication that some other person is responsible for said name and its indication, definition, or description," and Wiegmann, as is well known, gave no description of this species.

The *E. macrostemma* is the more active, sooner seeking the water, where it swims keeping close to the shore, and remaining more or less in sight until it conceals itself in a hole. The *E. melanogaster*, on the other hand, lies quietly so as to be more easily taken in the hand; but, if it once takes to the water, it seeks the depths and is no more seen. It is much less disposed to bite than the *E. macrostemma;* the latter being, like its ally, the *E. sirtalis*, a very pugnacious snake.

A number of specimens have been taken about Lakes Xochimilco and Chalco, Mexico.

Range.—In contrast to *angustirostris*, which occurs on the northern part of the Mexican plateau, *melanogaster* has thus far been recorded only from that part of the plateau which lies south of the 26th parallel. From this latitude it extends southward to Puebla, but has not been recorded from that State. Over the northern part of this region the environmental conditions are the same as in the northern part of the plateau, but to the southward the precipitation increases with the result that permanent rivers and lakes are formed.

Specimens have been examined from the following localities: Coyotes and Durango, Durango; Ocatlan, Jalisco; Lakes Xochimilco and Chalco, and Mexico City, Mexico; besides a number of others with no other locality label than "Mexico." Günther (1894, 134) records the following general localities: Guanajuato, Veracruz, Tehauntepec. Owing to its relationship to *angustirostris*, we do not believe that it occurs north of Coyotes, Durango, but the locality records probably do not represent the southern limit of its range (fig. 53).

Variation.—As in the case of *angustirostris*, far too few specimens of this snake are available to reveal whether or not geographic variation in scutellation exists. Certain general facts should be pointed out, however. The dorsal scale formula is 19–17 in every specimen examined, the ventral plates vary in number from 139–158 (average 145–150), the subcaudals from 49–67 (average about 58). These numbers indicate plainly that *melanogaster* has a distinctly reduced scutellation from the maximum for the genus, a fact which is not disproved by the labial formula. Thus, the supralabials are nearly always 8, the only differences consisting of a loss of a single plate, while the normal number of infralabials (10) becomes occasionally 9, and in but one instance 11. The tail length, as previously stated, varies from .19 (female) to .26 (male), the average length for every locality with two or more specimens being .22.

Affinities.—I have already pointed out in the discussion of the affinities of *angustirostris* that these two forms are evidently related in that the strongest distinguishing characters possessed by *angustirostris* (the segregation of the eye from all but one labial and the presence of more than two preoculars) apparently disappear in that part of the range which it shares with *melanogaster*. It is natural

to inquire now what particular evidence, if any, *melanogaster* shows of such consanguinity. Since we are inhibited by a lack of specimens from determining geographic variation, we can expect but little evidence from one form when the two are so very similar.

FIG. 53.—DISTRIBUTION OF THAMNOPHIS ANGUSTIROSTRIS MELANOGASTER, AS INDICATED BY THE LOCALITY RECORDS.

Specimens of the two forms are so nearly alike both in scutellation and color, that it is impossible to give any character that will always serve to distinguish them; but whether or not we grant that intergradation occurs at the present time, I hold it to be quite evident

that they are directly related. In this connection it should be noted that apparently in every series of scales *melanogaster* is more reduced than *angustirostris*. In the south *melanogaster* comes in contact with two very imperfectly known forms with which I believe it also to be related; these are *scalaris* and *phenax*, which will next be discussed.

SCALARIS.[a]

Description.—It is nearly always difficult to properly determine the characters and affinities of forms which are known from but few localities, owing to the fact that geographic differences are seldom revealed. This is particularly true of the garter-snakes of southern Mexico and Central America, a region from which a number of species have been described, none of which are represented in American museums by more than a few specimens. Of these forms *scalaris* is perhaps the best known, but, although access has been had to the material in the U. S. National Museum, Academy of Natural Sciences of Philadelphia, and the Field Museum of Natural History, it has been possible to find a total of but nineteen specimens, representing five localities.

As known at present, the form may be described as follows: Lateral stripe on the second and usually the adjacent edge or half of the third rows. Eye small. Dorsal stripe principally confined to the median row. Dorsal scale formula, 19–17, 19–17–15, 17–19–17, 17–19–17–15, or 17–15; supralabials, 7, very rarely 8; infralabials, usually 9, occasionally 8 or 10; oculars, 1–3 or 1–2; ventrals, 134 (female) to 151 (male); Subcaudals, 52 (female) to 76 (male).

Ground color above brownish ash, olive brown, or dark chocolate brown; the first row somewhat lighter. Stripes light ash to dull orange yellow. In some specimens there are no lateral spots to be observed on the scales, and in others there is a row of dark transverse bars between the third and seventh rows, inclusive, which alternate with a series of small spots on the eighth and ninth rows. In the majority of specimens, however, there is on either side a single series of large (one and one-half scales wide and one apart) rectangular, transverse, dark brown spots with dark edges, which extend from about the middle of the third to the median row of scales. These spots are well defined from the nape (where they are represented by a pair of large nuchal blotches) to the anus, are as distinct in the young of the single brood examined as in the adults, and the spots of each side are only separated by the dorsal stripe on the median row. Head above brown, generally marked with dusky yellow. Postoculars and supralabials dusky yellow. The plates in the latter series may not be margined with darker.

---

[a] *Thamnophis scalaris* COPE, Proc. Acad. Nat. Sci. Phila., 1886, p. 306. Includes *T. scaliger* JAN.

Habits and habitat relations.—Nothing is known of the habits of this form, but it is significant that several specimens in the U. S. National Museum, collected by F. Sumichrast, are labeled "Alpine region," by which is probably meant the pine zone surrounding the zone of grasses and herbaceous forms which margins the snow fields and glaciers of the summit. Dr. W. L. Tower informs me that the pine zone attains a maximum elevation of 13,000 or 13,500 feet. That *scalaris* occurs in this habitat is shown quite clearly by the fact that a series of specimens in the Field Museum of Natural History were taken at an elevation of 13,000 feet. These are the only available notes on the habitat of the form.

Range.—All that is known of the range of *scalaris* is indicated by the following records: Guanajuata; Jalapa and Mount Orizaba, Vera-

FIG. 54.—DISTRIBUTION OF THAMNOPHIS SCALARIS, AS INDICATED BY THE LOCALITY RECORDS.

cruz; Valley of Mexico and Toluca, Mexico; Tecpam, Guatemala; Talpa and Autlan, Jalisco; Oaxaco. We have examined specimens from all but the last three localities (Boulenger, 1893, 204). (Fig. 54.) Whether or not it is of general distribution in the region indicated by these records can not be conjectured, as practically nothing is known of its habitat relations.

Variation.—It is highly inexpedient to attempt to draw conclusions on the nature of the variations in such a small series as is here available more especially since fifteen out of the nineteen specimens hail from one locality. In the accompanying table, however, we give the scutellation and measurements of all of the specimens examined, and notwithstanding the scarcity of material certain facts stand out quite prominently. Thus, the *sixteen specimens from Orizaba and Jalapa,*

Veracruz, all have 17–19–17 scale rows or less, while none of the three specimens from the States of Mexico and Guanajuato have other than 19–17–15, and one of the Guatemala specimens has 19–21–19–17. Such a reduction in the number ot scale rows would represent a dwarfing within the form, but, regardless as to whether or not this apparent tendency is borne out by future investigations, it is quite evident from the predominance of the smaller dorsal scale formulas together with the evidently small number of labials that the form is, as a whole, a dwarfed one, so much so indeed that the number of scales in the dorsal, supralabial, infralabial, and ventral series attains the minimum for the genus, the form being more reduced than *butleri* in this regard. It should also be noted that the size of all of the specimens obtained is small.

Measurements and scutellation of Thamnophis scalaris Cope.[a]

Museum.	Number.	Locality.	Dorsals.	Supralabials.	Infralabials.	Oculars.	Subcaudals.	Ventrals.	Total length.	Tail length.	Percentage of tail to total length.
									mm	*mm*	
Field Museum	1517	Orizaba, Veracruz	17-19-17-15	7	9 10	1-3	61	141	.....	.....	.....
Do	1517	Mount Orizaba, Veracruz.	17-15	7	9	1-2	74	138	172	47	0.27
Do	1517	.....do	17-15	7	8	1-3	68	137	.....	.....	.....
Do	1517	.....do	17-15	7	9 10	1-2	65	136	173	44	.25
Do	1517	.....do	17-19-17-15	7	9	.....	66	140	175	43	.24
Do	1517	.....do	17-19-17-15	7	8	1-2 1-3	60	138	178	42	.23
Do	1517	.....do	17-15	7	8	1-2	75	137	170	47	.27
Do	1517	.....do	17-15	7	8 9	1-2	75	138	180	50	.20
Do	1523	.....do	17-19-17	7	9	1-3	61	144	.....	.....	.....
U. S. National Museum.	12115	Orizaba, Veracruz	17-19-17-15	7	9	1-3	59	135	347	82	.23
Do	30497	.....do	17-19-17-15	7	10	1-3	75	145	316	81	.25
Do	7076	"Alpine region," Orizaba, Veracruz.	17-19-17-15	8 7	10	1-3	58	145	406	90	.22
Do	7076	.....do	17-19-17-15	7	8 9	1-3	76	134	185	50	.27
Do	7076	.....do	17-19-17-15	7	9	1-3	72	137	207	53	.25
Do	7076	.....do	17-15	7	9	1-2 1-3	73	142	335	100	.29
Do	22281	Valley of Mexico and Toluca.	19-17	7	9	1-3	52	143	385	79	.20
Do	12675	Guanajuato	19-17-15	7	9	1-2	56	144	387	80	.20
Do	12730	Mexico, Mexico	19-17	7	9	1-2 1-3	52	151	410	78	.19
Academy Natural Science, Philadelphia.	11694	Jalapa, Veracruz	17-19-17-15	7	9	1-3	73	138	340	95	.28

[a] Since this table was compiled I have examined four specimens of *scalaris* from Tecpam, Guatemala, in the Field Museum. Three have 19-17 and one 19-21-19-17 scale rows.

Affinities.—Little reliance can be placed on efforts to determine in more than a general way the affinities of this form, but something can be done in this direction. In the first place, if we can pin our faith to the constancy of the trait, the position of the lateral stripe on the second and third rows at once excludes *scalaris* from the *Radix* and *Sauritus* groups. On the basis of our classification, then, it is to be referred either to the *Sirtalis* or *Elegans* groups. The latter has otherwise, so far as we know, no representatives in this region, but the ground for referring it to this group is mostly the negative one that the former group (*Sirtalis*) covers the same territory as *scalaris*, which argues against a relationship in this direction.

If *scalaris* is a derivative of the *Elegans* group it is quite important that its relationship with *melanogaster* (the nearest form, geographically, of the same group) be determined by careful collecting and observation. From the present data the ranges of the two forms seem to overlap in southern Mexico, but the habitats of the two may be quite distinct, a conclusion that is strengthened by the fact that on Mount Orizaba *scalaris* is found, to some extent at least, at a considerable altitude. On the other hand, it is not impossible, and I rather incline toward the hypothesis, that *scalaris* is more closely related to *elegans* than to any other form, and represents an offshoot of the latter which has pushed southward from the range of *elegans*, in the mountains of eastern Mexico. In defense of this view, it is interesting to note that *elegans* prefers comparatively high altitudes in the Rocky Mountains. At any rate, it is, as known at present, a well-defined form, which is liable to confusion only with *phenax*. Its relations to *phenax* will be discussed in considering the affinities of the latter.

PHENAX.[a]

Description.—The status of this form is much the same as that of *scalaris*. At the present time I know of but two specimens in American museums. Cope writes that specimens have been sent to both the Academy of Natural Sciences of Philadelphia and the U. S. National Museum, and records six specimens from the latter institution, but the only ones that I have been able to find in either museum is the type and a small individual, both in the National Museum. The proportions and scutellation of these specimens is given in the following table:

[a] *Thamnophis phenax* (COPE), Proc. Acad. Nat. Sci. Phila., 1868, p. 134.

Measurements and scutellation of phenax.

No., U.S.N.M.	Locality.	Dorsals.	Supralabials.	Infralabials.	Oculars.	Ventrals.	Subcaudals.	Total length.	Tail length.	Proportionate tail length.	Remarks.
								mm	*mm*		
30499	Orizaba, Cordova, Veracruz.	19-17	8	9	1-3	161	65	605	130	0.22	Type.
30498	.....do...............	19-17	7	9 10	1-3	158	73	275	67	.24	Immature.

There are no lateral stripes. In the type specimen No. 30499 (which has been in alcohol for many years) the ground color above is brownish olive (said to have been reddish olive in life) with a series of slightly darker cross-bands which extend entirely across the back to the second row of scales. These cross-bands (which are said to have been bright brownish red when the specimen was fresh) are about four scales wide and one and one-half scales apart, and are margined on the longer sides by black borders one-half scale wide, which, owing to the inconspicuousness of the spots themselves, give the snake the appearance of being cross-banded by paired narrow black bars. The nuchal spots are quite similar to the dorsal band in being but little darker than the ground color and heavily margined with black, but they differ from those of the dorsal series in being interrupted on the median line, the posterior black border on either side bending forward to the parietal plates. There is a trace of a dorsal stripe on the nape, between the nuchal blotches. No definite series of spots on the first row of scales. Head brown, marked with black. Supralabials brownish yellow (said to have been light olive in the fresh specimen), and, with the exception of the sixth, partly margined with black.

In the second specimen, No. 30498, the pattern differs from that of the type in that *the cross-bars are often interrupted along the median line*, in the presence of the spots on the first row of scales, that anteriorly form a definite row which alternates with the second, and the fact that the nuchal spots are fused across the nape, being strongly notched behind and separated in front by a light line that is continued along the parietal suture to the frontal.

Range.—Both of the specimens described above are labeled "Orizaba, Cordova." The type was listed by Cope as from "Cordova, Vera Cruz," and the locality of the six specimens recorded in 1898 was given as Orizaba, Vera Cruz. The label "Orizaba, Cordova" seems to mean, not that the specimens came from the towns Orizaba and Cordova, but from Mount Orizaba, in the canton Cordova. The range is thus apparently within the range of *scalaris*.

Variation.—If the specimens listed in the table are typical of this form, it is interesting to note that the scutellation is somewhat reduced, as shown by the dorsal scale formula of 19–17 and the tendency toward the labial formula 7/9. The other scale formulas can not of course be determined on the basis of two specimens, but it is evident that the tail is not long, as in the *Sauritus* group.

Affinities.—As illustrated by the described specimens, the coloration of *phenax* is strikingly characteristic, so that a much larger series of specimens must be examined before a serious attempt can be made to discover its affinities. Unfortunately we do not have the lateral stripe to aid us, as this is obsolete in the specimens examined, so that we must depend on the other characters. That it is not to be referred to the *Radix* or *Sauritus* groups seems to be sufficiently indicated by the fact that the forms of these groups, which occur in Mexico, show no tendency to acquire the *phenax* type of coloration, although two forms of these groups (*proximus* and *megalops*) come very close to or possibly overlap the range of *phenax*. Furthermore, on the same grounds we believe it to be very improbable that the form in question is to be referred to the *Sirtalis* group.[a]

The most probable near relative of *phenax* is, in my estimation, *scalaris*. Thus, as far as is revealed by the material examined, the scutellation and tail length is exactly similar to that of some specimens of *scalaris*, while the coloration of the former resembles that of the latter, as it does no other in the genus. Thus, in *scalaris*, as already pointed out, the large transverse blotches encroach upon the stripes which are narrow, and it only requires that these blotches of the opposite sides be continued across the back and the stripes entirely obliterated to produce a type exactly like *phenax*. It is interesting to note that in one specimen of *phenax* examined the crossbars are interrupted to some extent along the median dorsal line, producing two series of lateral blotches, as in *scalaris*, and that the general type of coloration exhibited by these two forms occurs nowhere else in the genus. I believe, therefore, that the two are very closely related, and since they are apparently found in the same localities it is most probable that the so-called *phenax* specimens simply represent individuals in which the process leading to the type of coloration exhibited by *scalaris* has been continued farther to the total obliteration of the stripes and the fusion of the lateral crossbars across the median region of the back. The distinctness of the form should be adhered to, however, until settled by more extensive investigation.

[a] Bocourt (Miss. Sci. Mex., Rept., 1893, p. 778) makes *phenax* a subspecies of *cyrtopsis* (*eques*), thus linking it with the *Sirtalis* group. I can find no justification for this except the similarity in scutellation, an unreliable factor upon which to base such conclusions, unless it be controlled by others. It will be shown later that *eques* is represented in this region by one dwarfed form, and that the latter is quite distinct from *phenax*.

HAMMONDI.[a]

Description.—This form, which was long considered a subspecies of *elegans*, has in late years been given the rank of a species. Any general description will not describe it accurately owing to the variableness of the most distinctive characters. A grayish or brownish yellow stripe on the second or second and third rows. Dorsal stripe usually wanting, occasionally represented on the nape, rarely present for the entire length and then but faintly. Dorsal scale formula, 21–19–17 (occasionally 19–21–19–17). Supralabials, 8 (rarely 9). Infralabials, 10 (occasionally 9 or 11). Oculars, 2–3, 2–4, 1–2, or 1–3. Subcaudals, 65–96. Ventrals, 155–178. Proportionate tail length, .21–.27. Color above the lateral stripes dark grayish or olive brown, marked with four rows of small alternating black spots. First row usually a little lighter than above and with or without a small black spot on the base of each scute. Small nuchal blotches. Belly greenish or yellowish ash without a median ventral shading formed by the median prolongation of the black bars at the base of the ventral scutes.

Habits and habitat relations (fig. 55).—The only observations known to me on the habits of this snake are those recorded by Van Denburgh and Grinnell:

> Like other members of its genus, this snake swims well and is usually found in or near water. Its food consists mainly of aquatic animals, such as fish, frogs, and tadpoles. One specimen was caught with a good-sized trout in its teeth. (Van Denburgh 1897, 214.)
>
> This is the water snake of the mountain regions, and is abundant in summer along the San Gabriel, Arroyo Seco, and Tujunga canyons. It occurs also tho more sparingly in the smaller canyons and out along the water courses a few miles into the valley country.
>
> Many years ago before the pumps had drained the water from the Arroyo bed west of Pasadena there was a good-sized stream there all summer. Along this stream the California garter-snake was very common. There were sometimes four in sight at once along the sandy banks. When alarmed they would take to the water and disappear into the deeper places for a short time or swim gracefully across the brook and crawl out on the opposite bank.
>
> This snake feeds on tadpoles, small frogs, and fish. We have seen a garter-snake so gorged with tadpoles that when alarmed it had to give up some of its cargo, the released tadpoles wriggling out of the snake's mouth apparently none the worse for wear. (Grinnell, 1907, 49–50.)

Range.—This species is only known from southern California and northern Lower California. The specimens examined represent the following localities: La Guilla, San Pedro Martir Mountains, and San Antonio, Lower California; Twin Falls, Soda Springs, Los Angeles San Bernardino County, San Diego County, Fort Tejon, Fresno, Alvord, Cartago, Bishop, South Fork Kern River (25 miles above Kernville), Kern River Lakes, Kern Lake, California; "Mohave Desert, Arizona."

---

[a] *Thamnophis hammondi* (KENNICOTT), Proc. Acad. Nat. Sci. Phila., 1860, p. 332. Includes *E. couchi* and *E. elegans couchi* of various authors, but not of KENNICOTT.

FIG. 55.—HABITAT OF THAMNOPHIS HAMMONDI. STREAM AT BALDWIN'S RANCH, ABOUT 20 MILES EAST OF LOS ANGELES, CALIFORNIA.

The most northern localities from which we have examind specimens are Owens Lake, Kernville, and Fresno, California, the latter locality indicating that it enters the interior valley of California. To what extent it occurs in this valley can not be determined until its relation to *elegans* is known. The southernmost locality in which it has been found is La Guilla, Lower California. The form is thus known

FIG. 56.—DISTRIBUTION OF THAMNOPHIS HAMMONDI, AS INDICATED BY THE LOCALITY RECORDS.

only from the mountainous region of southern California and northern Lower California, and what is known of its habits would indicate that it will not be found commonly in the desert region adjoining unless it be in the mountains[a] (fig. 56).

[a] The locality "Mohave Desert, Arizona," is too general to be relied upon.

Variation.—I have been able to examine but forty-four specimens of this form, and as the localities of these are scattered over the entire range the series from each locality is small. The material can not, therefore, be expected to yield definite information as to the extent and nature of the variations. Fortunately, however, the variation in most of the characters is slight. The dorsal scale formula is quite constantly 21–19–17 in every locality, the only variation observed being in the occasional occurrence of the formula 19–21–19–17 in specimens from localities representing every part of the range. The supralabials are 8 in every specimen examined, with the exception of one from San Diego County, which has 9 on one side. The infralabials are nearly as constant in number, as the only specimens in which the number departs from 10 are five, one from San Bernardino County, one from San Diego County, and one from Cartago, all of which have 11 on one side; one from Fort Tejon with 12 on one side, and one from the "South Fork of Kern River," which has 9 on one side. The labial formula is thus quite constantly 8/10 over the entire

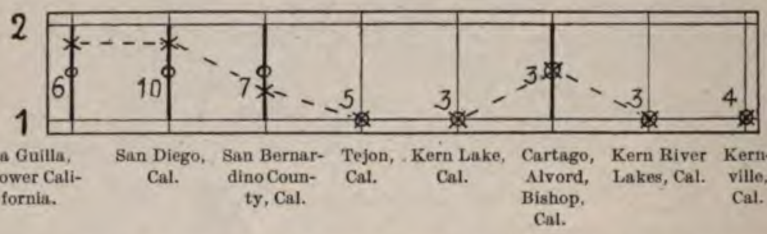


FIG. 57.—DIAGRAM SHOWING THE VARIATION IN THE NUMBER OF PREOCULARS IN THAMNOPHIS HAMMONDI.

range, and much larger series are needed if there are any geographic differences to be revealed in either the labial or dorsal formulas.

As regards the preoculars the case is different. As previously stated, the number may be 1 or 2, and it is interesting to mention that in a number of specimens examined with 2 the two scales are partially fused, which seems to indicate further that the number of preoculars is intermediate. In the table that forms fig. 57 is shown the geographic distribution of this trait. This diagram seems to indicate that in the southern part of the range there is a decidedly greater tendency toward two preoculars than to the northward, a fact which, if true, is a significant one.

As far as can be determined from the material at hand the number of ventral and subcaudal plates and tail length exhibit no geographic differences, the limits being: Subcaudals, 65–81 (females), 71–96 (males); ventrals, 155–171 (females), 164–178 (males); tail length, about .21–.25 (females), .25–.27 (males). It is hardly necessary to point out that these limits, based as they are on a small amount of

material, will doubtless be corrected with more specimens, but they indicate the general conditions.

Affinities.—The possession by this form of two preoculars in the southern part of its range is very interesting, since it is in this region that it approaches nearest to the region inhabited by *angustirostris*, and the division of the preoculars (a rare trait in the genus) furnishes a strong inducement to consider its presence in both forms an evidence of direct relationship. The derivation of either of these forms from the other is not as improbable as it may seem at first sight, for they are closely similar, especially in the adjacent parts of their ranges. They have apparently the same number of dorsal, labial, ventral, and subcaudal scales and tail length, besides possessing in common the characters of more than one preocular and absence of the dorsal stripe. *Hammondi* differs from *angustirostris* in generally having two instead of three preoculars, the eye in contact with two labials, not well-defined lateral spots, and in the presence of stripes. Since *angustirostris* often has but two preoculars, and indeed apparently to the south grades into a form (*melanogaster*) which has but two, it is not impossible that the number also decreases in the northern part of the range. We have already seen that the other scale character (the separation of the eye from one labial) suffers a similar fate. The only apparent differences between *angustirostris* and *hammondi* that remain, then, are the presence of the stripes and the obscurity of the lateral spots. These differences are comparatively slight, but the fact that the dorsal stripe is nearly always wanting in *hammondi* renders the differences still less. In fact, in the general type of coloration as well as in the arrangement of the ocular scales, *hammondi* is similar to *melanogaster*, and I believe that there is strong evidence for concluding that *angustirostris* is genetically midway between these two forms.

Its resemblance to *angustirostris* decreases in the northern part of its range, and *hammondi* comes to resemble another form (*elegans*), which replaces it to the northward. Its resemblance to this form is so close that specimens from near the range of the latter (Inyo, Kern, Tulare, and Fresno counties, California) are distinguished with the utmost difficulty. This is brought about by the fact that *hammondi* usually has a single preocular in the northern part of its range and occasionally a dorsal stripe, and it can with certainty be distinguished from *elegans* only when it has either two preoculars or no dorsal stripe. However, sufficient proof that these forms actually intergrade is wanting. Their relations will be considered more fully when the affinities of *elegans* are discussed.

ELEGANS.[a]

Description.—On the high plateau region and in the Sierra Nevada-Cascade and Rocky Mountain ranges of North America occurs one of the best known and least well-defined forms in the genus. This form, as here understood, consists of the snakes usually referred to *vagrans* and in part also to *elegans*, *biscutata*, *infernalis*, and *lineolata*.[b] The lateral stripes are on the second and third scale rows, the dorsal usually on the median and a varying amount of the adjacent rows, being usually encroached upon by the spots of the upper series. Both dorsal and lateral stripes often indistinct, the dorsal occasionally absent for a part or all of the length. Dorsal scale rows, 21–19–17 or 19–21–19–17; labials, 7/9, 7/10, 8/9, 8/10, or 8/11; preoculars, 1 or 2; postoculars, 2, 3, or 4; subcaudals, 65–79 (females), 80–96 (males); ventrals, 152–169 (females), 163–182 (males).

The form is moderately robust; tail length about .18–.24 in females, .24–.276 in males, although these limits are rarely attained. Head distinct, eye small. Postgenials usually as short or shorter than the preceding pair, but occasionally longer. Two rows of alternating black spots on either side between the lateral and dorsal stripes, which are usually, although not always, distinct on the scales (see frontispiece). Nuchal blotches usually rather small, and generally interrupted by the lighter keels of the scales. Head brownish, often considerably marked with black. Labials only narrowly margined, if at all.

Habits and habitat relations.—The form apparently differs little from the other garter-snakes in preferring the proximity of water, either in the form of marshes, ponds, lakes, or streams. Various writers describe its habits as follows: Coues (1875, 614–615): "My specimens were found along the Zuni River in New Mexico wherever this stream spreads into sluggish lagoons, basking on the floating plants or swimming freely in the water like a Nerodia or Regina." Merriam (1891, 15): "Several garter-snakes (*Eutænia vagrans*) were found in the water in small, cold streams emptying into Salmon River a few miles north of Round Valley." Cope (of his variety

---

[a] *Thamnophis ordinoides elegans* (BAIRD and GIRARD), Catalogue of North American Reptiles, 1853, pp. 34–36. Includes *Eutænia vagrans* BAIRD and GIRARD, *E. biscutata* COPE, *T. vagrans biscutata* VAN DENBURGH (part.), *E. infernalis* COPE, *E. elegans lineolata* COPE, *E. elegans brunnea* COPE, *E. henshawi* YARROW, *E. couchi* KENNICOTT, and *E. vagrans plutonia* YARROW.

[b] My conception of this and the following form will appear strange to most herpetologists. A careful study of the material, however has shown that it is impossible to recognize the forms *vagrans*, *elegans*, *lineolata*, *atrata*, *leptocephala*, *trilineata*, and *biscutata* as they are usually defined. In fact a perusal of the literature will show that no two writers are agreed as to the importance of the several forms that have been described.

biscutata): "This species is not uncommon in the swamp vegetation on the borders of the lake" (fig. 58). A series of specimens sent to me from Flathead Lake, Montana, were taken on the shore of the lakes and in neighboring swamps. I can find nothing on the food habits of this garter-snake, but in view of these habitat notes it is probable that frogs and fish form an important part of the food of the

FIG. 58.—HABITAT OF THAMNOPHIS ORDINOIDES ELEGANS. KLAMATH MARSHES, SOUTHERN OREGON.

individuals found in these habitats. While, however, *elegans* thus apparently prefers an aquatic habitat, it is probably not strictly confined to the vicinity of water except in the more arid regions. This conclusion is borne out by the fact that a specimen in the U. S. National Museum from Boulder County, Colorado, is labeled "bare

rocky hill," and from the stomach of another from Conejos, Colorado, I removed the remains of a field mouse (badly flyblown). Proof that it is not an arid type is again found in the fact that it is found at considerable altitudes (8,500 and 10,000 feet) in the forest zones. (See list of localities below.)

Range.—*Elegans* has a very extensive distribution. At the present time it is known to extend from the western margin of the great plains, in eastern New Mexico and Colorado, and western Nebraska, South Dakota, and central Montana, westward through the Rocky Mountains and high plateau regions to the west slope of the Sierra Nevada and Cascade ranges, and from the southern margin of the high plateau in New Mexico and Arizona to southern Canada. As detailed notes on distribution are not available, a general description of the environmental conditions of the range will be sufficient. The whole region consists of numerous mountain ranges, rising from lower plains which have an altitude of 5,000 to 8,000 feet, although on the Columbia River lava plains, Snake River plains, and about Great Salt Lake the elevation is lower. The mountains receive most of the rainfall, and support extensive forests on the higher elevations, while the plains, owing to the scanty precipitation which they receive, are arid and support a more xerophytic flora, which varies with the intensity of the conditions. The region is limited by lower elevations, on the east by the high plains, on the south by the proplateau, which extends far northward in western Nevada, and on the west by the interior valleys of California and Washington and Oregon. In southern and northern California and southern Oregon, however, it reaches the coast, as elevated areas here connect the Sierra Nevada-Cascade and coast ranges.

Specimens have been examined from the following localities: Sapello Canon (altitude 10,000 feet), San Miguel County, Chico Springs, Albuquerque, Albiquiu, Taos, San Ildefonso, Willow Springs, San Juan River, Cantonment Burgwyn, Fort Wingate, Fort Garland, San Francisco Mountains, New Mexico; Conejos, San Luis Valley, Rio Grande, Durango, Pagosa, Boulder County (altitude 9,500 feet), Gypsum, Grand Junction, Twin Lakes, Hayden, Colorado; Black Hills, Dakota; Bozeman, Fort Benton, Fort Custer, Flathead Lake, Billings, Cache Le Poudre Creek, Fish Creek, Swan Lake, Helena, Montana; Yellowstone Park, Fort Laramie, Fort Fetterman, Wyoming; Vernon, Sicamous, Nelson, Bear Lake, Rocky Mountain Park, British Columbia; Lewiston, Ketchum, Fort Hall, Idaho; Pyrmont, Camps 10 and 12 (Ridgway), Snake Valley, Silver Creek, Lake Tahoe, Ash Meadows, Nevada; Fort Bridger, Juab, Rattlesnake Mountain, Copenhagen, Ogden, Utah; Fort Whipple, Fort Verde, San Francisco Mountain, Mineral Spring, Prescott, Arizona; Horse Corral Meadows, Humboldt Bay and Humboldt River, Tenaya Lake Meadows, Eagle

Lake, Camp Bidwell, San Joaquin River (altitude 8,100 feet), Eldorado, Kern Lake, Kern River, Mount Whitney, North Fork Kern River, Whitney Creek (Crab Tree Meadow), Whitney Creek (9,000 feet below Whitney Meadows), Mount Whitney (Hot Springs, altitude 8,000 feet), Owens Valley, Lone Pine, Owens River (altitude 6,000 feet), Morro, Baird, Pit Canyon, California; Goose Lake, between Warner and Goose Lakes, Fort Klamath, Klamath Lake, Camp Warner, Dallas, Oregon; Fort Walla Walla, Washington.

If *elegans* were generally distributed over the region in which it is found its range of habitat could scarcely be exceeded in the western half of the North American continent, as the region which it inhabits includes on the one hand the arid plains of the Proplateau region, and on the other the snow-capped peaks of the Rocky and Sierra Nevada-Cascade ranges, but, although the data at hand on the habitat distribution of the form is very meager, evidence is not wanting that it is not of general distribution in the region which it occupies. From what is known of its habits it is not surprising to find that the range of *elegans*, as shown by the above localities, is principally confined to the higher elevations, where there are perennial streams. The probable limits of its range can thus be discussed.

As it is found on the Proplateau in southern Nevada, it may be found on the mountain ranges of the same feature in southern Arizona, New Mexico, and Texas. Van Denburgh (1897, 211) writes that it "is known to live on both slopes of the Sierra Nevada throughout the whole length of the chain." I believe this to be true, although not in the sense meant by Van Denburgh, for we must include specimens formally referred to *elegans* in order to establish its presence on the west side of the Sierra Nevadas. It has been recorded several times from east of the high plateau region, but none of these records are trustworthy. The specimen found at Chicago,[a] while undoubtedly an *elegans*, unquestionably reached there accidentally.

Taylor (1892, 326) records specimens from Gage, Nemaha, and Sheridan counties, Nebraska, but these localities are so much farther east than any other authentic records for the form that they must be seriously questioned until confirmed. Branson (1904, 366) states that "this snake is quite rare in the western part of Kansas. None have been reported from the eastern part." As he gives no localities, however, and I have neither seen a single specimen from this State, nor know of an authentic record, I consider the specimen from Colorado as representing the known eastern limit of the range of *elegans* in this latitude; the more so as the western border of Kansas is some distance east of the contour line of 5,000 feet, which may be considered as marking the eastern boundary of the high

[a] Compare Ruthven, 1904, 291.

plateau region. At the present time, therefore, *elegans* is not definitely known to occur east of this region, although it may occur to some extent along the streams on the great plains immediately

FIG. 59.—DISTRIBUTION OF THAMNOPHIS ORDINOIDES ELEGANS, AS INDICATED BY THE LOCALITY RECORDS.

adjoining, as will be shown later. Thus, Coues (1878, 275) found in Montana that:

The wandering garter-snake does not appear to be generally distributed along the northern boundary line. It was not met with during the first year of my connection with the survey in any part of the Red River watershed, nor was it seen the second season except to the westward from the main outliers of the Rocky Mountains to the main chain itself.

As will be seen later, its western limit can not be drawn exactly owing to the fact that it intergrades with another form on the Pacific coast, but if specimens with a scale formula of not less than 19–21–19–17 are considered *elegans*, it is found to the foot of the Sierra Nevada-Cascade range on the west side, throughout the length of the chain, bending westward in the mountainous region of northern California to the coast. The range, as far as it is definitely known at present, is shown on the accompanying map (fig. 59).

Variation.—We have examined 218 specimens of *elegans* from various localities scattered over the entire range of the form and find that there is very little geographic variation in the scutellation. In fact the only two characters that exhibit geographic differences are the dorsal scale formula and preoculars. In fig. 60 we have plotted the dorsal scale formula for suites of specimens representing the range of the form. It will be noted from this diagram that while the formula 21–19–17 occurs most frequently, the formula 19–21–19–17 apparently occurs throughout the range, so that the average formula for the form may be considered somewhat intermediate between 21–19–17 and 19–21–19–17. It will be noticed, however, that in western specimens (from British Columbia and in the Sierra Nevada-Cascade range)

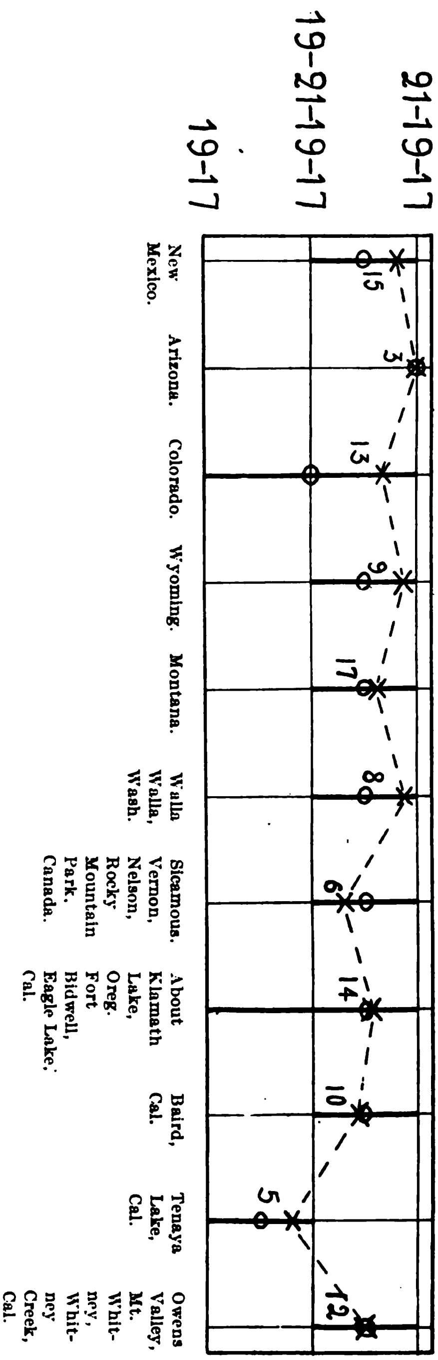


Fig. 60.—Diagram showing the variation in the dorsal scale formula in Thamnophis ordinoides elegans.

there is apparently a greater tendency toward a smaller formula than 21–19–17 than elsewhere in the range. This reduction is a real one, and it takes but little familiarity with the material to bring out the fact that there is a reduction in the number of scale rows all along the western boundary of the form (see map, fig. 59). It is in part owing to this fact that the number of scale rows of *elegans* (in the old sense) has been so frequently a disputed subject.

The supralabials are nearly always 8, but in nearly every locality, irrespective of its place in the range, one or two specimens have 7 upon one or, more rarely, both sides, but 9 plates are so rare that we have seen but one specimen which had this number and then only on one side. Likewise the number of infralabials, while 10 in the great majority of specimens, is occasionally 9 and much more rarely 11. In fact the average formula for every locality where a considerable number of specimens have been examined is never higher than 8/10, and very often about 7.8/9.8, thus indicating that the form tends to have a smaller formula than 8/10. No geographic differences can be observed.

As in the case of the labials, the material shows no geographic differences in the ventral and subcaudal scutes and tail length. The

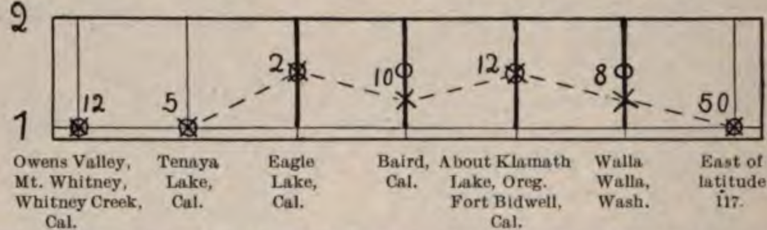


FIG. 61.—DIAGRAM SHOWING THE VARIATION IN THE NUMBER OF PREOCULARS IN THAMNOPHIS ORDINOIDES ELEGANS.

sexual variations are as follows: Ventrals, 152–169 (females), 163–182 (males), average about 169; subcaudals, 65–79 (females), 80–96 (males); tail length, .18–.24 (females), .24–.276 (males).

Over the greater part of its range *elegans* has but a single preocular. As Cope (1883, 21–22) first pointed out, however, certain garter-snakes from southeastern Oregon have two scutes in this series. Cope made this trait the basis of a distinct species (*biscutata*), but the likeness of these snakes to *elegans* (*vagrans*) were recognized by Brown (1901, 23–24) and Van Denburgh (1897, 212), and they were classed as a subspecies of *elegans* (and *vagrans*).[a] As this is the only character by which these snakes differ from typical *elegans*, and it is far from being constant in this region, it is absurd to attempt to distinguish a distinct subspecies on this basis. Nevertheless the occurrence of two preoculars in the form is interesting. In the diagram (fig. 61) I have plotted the distribution of the trait, and there is shown to be a strong tendency toward divided preoculars in northern

[a] Under the name *biscutata*, Brown and Van Denburgh also included with these *elegans* specimens individuals of *ordinoides* with two preoculars.

California and east central Oregon and Washington. At first sight the localities in which two preoculars occur seem to represent an isolated region, but, as will be shown later, I believe that the trait outcrops all along the western boundary of the range (in the Sierra Nevada-Cascade range) from the southern limit in the mountains of southern California to the northern limit in British Columbia.

Elegans is quite constant in coloration over most of its range. The following description holds for most of the specimens east of the Sierra Nevadas: Ground color light brownish olive, relieved by two rows of rather small black lateral spots that usually occupy only the edge of the scales; stripes yellow, tinged with orange or green, the laterals upon the second and third rows and frequently nearly indistinguishable from the first row of scales which is lighter than those above, the dorsal upon the median and more or less of the adjacent rows being nearly always encroached upon to the median row by the superior row of lateral spots; narrow bars at the base of the ventral scutes that may or may not be enlarged at the ends to form small spots and in the middle to make an irregular median ventral band.

In the Sierra Nevada-Cascade range the color tends to become generally darker, although the pattern of eastern specimens is retained. Such individuals have been distinguished by Cope (1892, 654–655) as *lineolata* and *brunnea*, but an examination of the types as well as many other specimens from the same region shows that they differ in no way from typical *elegans* except in the darker ground color, which obscures the lateral spots on the scales. In his description Cope states that in the type of *brunnea* there is not the least trace of lateral spots. This is not true, as they are easily seen on the skin when it is stretched. Specimens do occur on the west slope of the Sierras, however, in which the spots are mostly fused on the skin. This dark color is frequently accompanied by an increase in the width of the dorsal stripe, a tendency which in *elegans* occurs only in this region, but, as I shall show later, becomes of general occurrence to the westward. Such a specimen was described as *elegans* by Baird and Girard in 1853, but that the combination of characters can not be distinguished even as a subspecies is quite evident, as all intermediate stages occur between it and the dark (*lineolata* or *brunnea*) specimens of *elegans* in the Sierra Nevadas, while the scutellation is identical.[a]

Occasionally the dorsal stripe is nearly or quite obsolete, as in *hammondi*. Such a specimen was described by Kennicott as *E. couchi*. Some writers have considered these specimens identical with *hammondi*, but all variations in the width of the dorsal stripe occur, and it is evident that its total or partial obliteration is merely a variation.

[a] It is true that Baird and Girard gave the number of dorsal rows of the type specimen of *elegans* as 19, but these were evidently counted on the anterior part of the body alone, for the formula is 19–21–19–17, as in many specimens of *elegans* (*vagrans*).

Yarrow's (1883, 152) subspecies *plutonia* was based on melanistic specimens, as were also those which he (1875, 554) referred to *E. vagrans angustirostris* (Kennicott) and *E. henshawi* Yarrow (1883, 152). Melanism is more than usually common in the form. It is of interest that three specimens (No. 1133) in the Field Museum of Natural History from Grand Junction, Colorado, are all melanistic, and correspond closely to those listed by Cope as *plutonia*. As far as our present knowledge goes, the only definite geographical variation in color is an increase in black pigment in the Sierra Nevada-Cascade individuals, and a tendency toward an increased width of the dorsal stripe on the west slope of the Sierra Nevadas.

Affinities.—I have already stated that I believe *elegans* to be directly related to *hammondi*, which it meets in southern California. There are no apparent differences between the two forms which insure a certain distinction of the specimens in the intermediate region. The reason why some writers have insisted upon the distinctness of the two forms is because they have generally laid stress upon a single character in diagnosing their specimens. It has already been shown that although *hammondi* is usually characterized by 21–19–17 dorsal scale rows, two preoculars, the absence of a dorsal stripe, and no definite spots on scales, in the northern part of its range 19–21–19–17 scale rows, one preocular, and a dorsal stripe often occur; while *elegans* in the same region may have either 19–21–19–17 or 21–19–17 dorsal rows. The reason why *elegans* apparently does not exhibit two preoculars and an obsolete dorsal stripe in the southern part of its range may very well be due to the fact that specimens with these traits are referred to *hammondi*.

The fact that the characters may seemingly occur in any combination in the intermediate region leads one to suspicion that an intergrading actually takes place, and that the differences between the specimens are individual and not racial. However, this controvertible point can not be decided until a large series of specimens with detailed habitat notes has been obtained from the intermediate region. But whether or not intergrading occurs, I believe that there can be little question that the two forms are directly related. This belief is confirmed by the reduction in the number of scale rows in *hammondi* toward that part of the range of *elegans* with which it comes in contact and by the fact that it is only in the western part of its range that *elegans* possesses two preoculars. I have already called attention to the fact that in the Sierra Nevada-Cascade range *elegans* often has two plates in front of the eye, so frequent a trait in *hammondi*, and it is only necessary to note here that if *elegans* has been derived from *hammondi* the resemblance of the former to the latter should be the strongest along this range, as it is a highway for moisture-loving forms from southern California northward. If this nation is the true one, the Sierra Nevada-Cascade range may

be considered as the center of dispersal for *elegans*, a fact that explains the wider separation of the high plateau and Rocky Mountain individuals of *elegans* from *hammondi* as shown by the fact that the former apparently never have two preoculars. The hypothesis may be further tested by examining the Pacific coast form of this group.

I have already referred to the fact that *elegans* apparently tends to become reduced as to the number of scale rows on the western slope of the Sierra Nevada-Cascade ranges. This reduction is hardly to be detected when true *elegans* specimens (those with 19–21–19–17 or 21–19–17 rows and from the slope of the mountains) are alone considered, but when those from the foot of the mountains are considered the reduction is strikingly evident. So pronounced is this that in the interior valleys between the Sierra Nevada-Cascade and the coast ranges from British Columbia to Kern County the form becomes transformed into another (*ordinoides*), with a dorsal scale formula as small as any in the genus. This subject will be reverted to in the discussion of the next form, and it is only necessary to point out here (1) that the intergradation between the two forms is perfect, and (2) that it takes place rapidly. Material is not available to fix the limits of the intermediate region, but, as shown by the distribution of the two forms, it may be placed tentatively as the long westward slope of the Sierra Nevada-Cascade range. It should be noted further, however, that specimens from this intermediate region (Fresno and Oakland, California) also exhibit occasionally two preoculars, as does also true *ordinoides* (see p. 152), thus showing that the trait occurs quite close to the range of *hammondi*.

The average number of ventrals is about 169, even in northern New Mexico and Arizona, where it approaches the range of *marcianus*. This, with the smaller dorsal scale formula, seems to us to indicate that *elegans* has been derived from some form with a larger number of ventral plates than *marcianus*, in which the average number falls between 155–160.

ORDINOIDES.[a]

Description.—West of the Sierra Nevada-Cascade range, in California, Oregon, and Washington, there occurs a form of garter-snakes that has caused herpetologists considerable embarrassment. As here

[a] *Thamnophis ordinoides* (BAIRD and GIRARD), Proc. Acad. Nat. Sci. Phila., 1852, p. 176. Includes *E. leptocephalus* BAIRD & GIRARD, *E. cooperi* and *E. atrata* KENNICOTT, *E. elegans vidua* COPE, *T. rubristriata* and *T. leptocephalus olympia* MEEK, and in part the *E. elegans infernalis*, and *E. biscutata* of various authors, but not of the original describers. It seems that most writers have been uncertain as to just what form this name should apply. This uncertainty has been brought about by the description of the form given by Baird and Girard in 1853 (1853, 33–34), which applies equally to *parietalis*, *elegans*, and the present form, and indeed of the three specimens listed the first is a *parietalis*, and the second a specimen of the present form with 21–19–17 rows. These specimens are labeled types of *ordinoides*, but it should be recalled that *ordinoides* was described in 1852 and on the basis of a specimen from

understood, *ordinoides* includes the following described forms which are recognized by different writers at the present time: *elegans*, *atrata*, *biscutata* (part), *leptocephala*. It will seem strange to some herpetologists that I have defined this form as I have, but if the published writings are indicative, no two of the present day authorities will agree as to just which ones it should include, and this very diversity of opinion is an evidence of the close resemblance that exists between the several forms that are usually recognized.

The lateral stripe is frequently absent, but when present is always upon the second and third rows, and usually grayish or yellowish in color, frequently red for more or less of its entire length. The dorsal stripe is apparently always present except in melanistic individuals and is usually well defined, not being encroached upon by the upper series of lateral stripes. It may be one, one and one-half, or three scales in width, and pale yellow, bright orange yellow, or red in color. The form is very variable. The scale rows may be 21–19–17, 19–21–19–17, 19–17, 17–19–17–15, 17–15, 15–17–15, but are usually 19–21–19–17 or less. The supralabials are usually 8, often 7, occasionally 6; infralabials 7, 8, 9, or 10, rarely 11 or 12. The oculars are usually 1–3, often 1–2, occasionally 1–4, frequently 2–3 or 2–4, rarely 3–3. Unfortunately I have not been able to examine the sex of a sufficient number of individuals to determine, even in a general way, the limits of sexual variation in the number of subcaudals and ventrals. The individual variation is, however, very great. The extremes are: Ventrals, 132 (female)–172 (male); subcaudals, 55 (female)–91 (male). Chin shields short, subequal, or nearly so. Eye small.

There is no single well-defined type of coloration, but the form may generally be known by the following description: The ground color of the dorsal scales may be black, brown, dark or light olive, with or without small lateral spots. The skin may be either marked by two distinct rows of black spots with light interspaces or be mostly black with small, irregularly disposed areas of lighter. The interspaces on both skin and scales frequently considerably suffused with red. The belly is generally some shade of olive or yellow, frequently spotted with red in the middle. Head olivaceous, brownish or black.

Habits and habitat relations.—I know of no recorded observations on the habits or habitat of this snake.

Range.—As above defined, *ordinoides* is known to inhabit in a general way the region lying between the Sierra Nevada-Cascade range and the Pacific Ocean, extending from the Tehachapi Moun-

---

Puget Sound. Although we have not been able to find the type, the original description is perfectly clear, and two characters mentioned therein—two preoculars and two distinct rows of spots—shows conclusively that the description was based on a specimen of the western form described again in 1853, and since then known as *leptocephalus*. The name *ordinoides* thus takes precedence over *leptocephalus*. I am not certain of the identity of *Coluber infernalis* Blainville.

tains, California, on the south to southern British Columbia on the north. I have examined specimens from the following localities: Monterey, Oakland, Fresno, San Francisco, Nicasio, San Pablo Creek, Eureka, Mendocino, Santa Cruz County, Crescent City, California; Willamette Valley, Chilowynck, Gold Beach, Fort Umpqua, Astoria, Portland, Oregon; Tahot plain, Shoalwater Bay, Chalahapa, Attlapootl, Port Orchard, Fort Townsend, Olympic Mountains (30 miles from Port Angelus), Puget Sound, Seattle, Fort Steilacoon, Tacoma, Washington; and Comox Lake, Victoria, Vancouver Island. While its distribution is quite definitely limited on the north and west, I believe that it is impossible to fix the exact eastern and southern boundary of *ordinoides* for the reason that it intergrades with *elegans* throughout the entire length of its range. If I am correct in this opinion, there remains to be established the region of intergradation of the two forms. Van Denburgh (1897, 209, 211) has recorded specimens from as far east as Tuolumne Meadows (Tuolumne County), Yosemite Valley (Mariposa County), Lake Tahoe (Placer County), and El Dorado County, California, and writes that *vagrans* (*elegans*) "is known to live on both slopes of the Sierra Nevada throughout the whole length of the chain," in which case the ranges of the two forms would overlap. As previously stated (pp. 140–141), I have examined specimens similar to those usually referred to *elegans* from El Dorado, Mariposa (Tenaya Lake Meadows), Tuolumne (Tuolumne Meadows), Placer (Lake Tahoe), and Shasta (Baird) counties, California, and Dalles, Oregon, and prefer to consider them all as belonging to *elegans* (*vagrans*); while true *ordinoides* only occurs in material from the base of the mountains and to the westward. It is impossible, however, at present to draw the exact line along which these forms intergrade, both owing to the lack of specimens and to the uncertainty of the exact locality from which the specimens that we have were taken. As has been elsewhere stated, collectors are too prone to label their material with the name of the nearest conspicuous landmark, although the latter may be miles distant. Thus, a series of specimens "from a collector at Oakland" (Brown 1903, 289) are evidently intermediate, but they cannot be used, as we do not know the exact part of the county from which they came.

For the present, therefore, we can only say that *ordinoides* meets *elegans* somewhere on the lower level of the western slope of the Sierra Nevada-Cascade range, but if the former be distinguished from the latter, as we have indicated above, by a more reduced scutellation, and the frequent increased width of the dorsal stripe, we may consider specimens from Stockton, Fort Reading, and Dalles, as intermediate between the two forms.

As might be expected, the range of *ordinoides* is nearly divided in northern California and southern Oregon by the mountainous

district that here bridges the gap between the Sierra Nevada-Cascade and coast ranges. That *elegans* pushes westward in these mountains nearly to the coast is shown by specimens from Baird, Shasta County, and several specimens in the U. S. National Museum labeled "Humboldt River" and "Humboldt Bay, California." From the latter records it might seem that *elegans* reaches the coast in this region, but since specimens from Eureka in the Field Museum are

FIG. 62.—DISTRIBUTION OF THAMNOPHIS ORDINOIDES, AS INDICATED BY THE LOCALITY RECORDS.

true *ordinoides*, as well as some of the Humboldt Bay specimens in the U. S. National Museum, the conclusion is justified that all of the specimens in the latter series were not taken in the immediate vicinity of the bay, the *elegans* individuals probably having been taken in the mountains to the eastward. The known range of the form is indicated on the map (fig. 62).

Variation.—The dorsal scale formula of *ordinoides* is generally small, as shown by the accompanying diagram (fig. 63). The

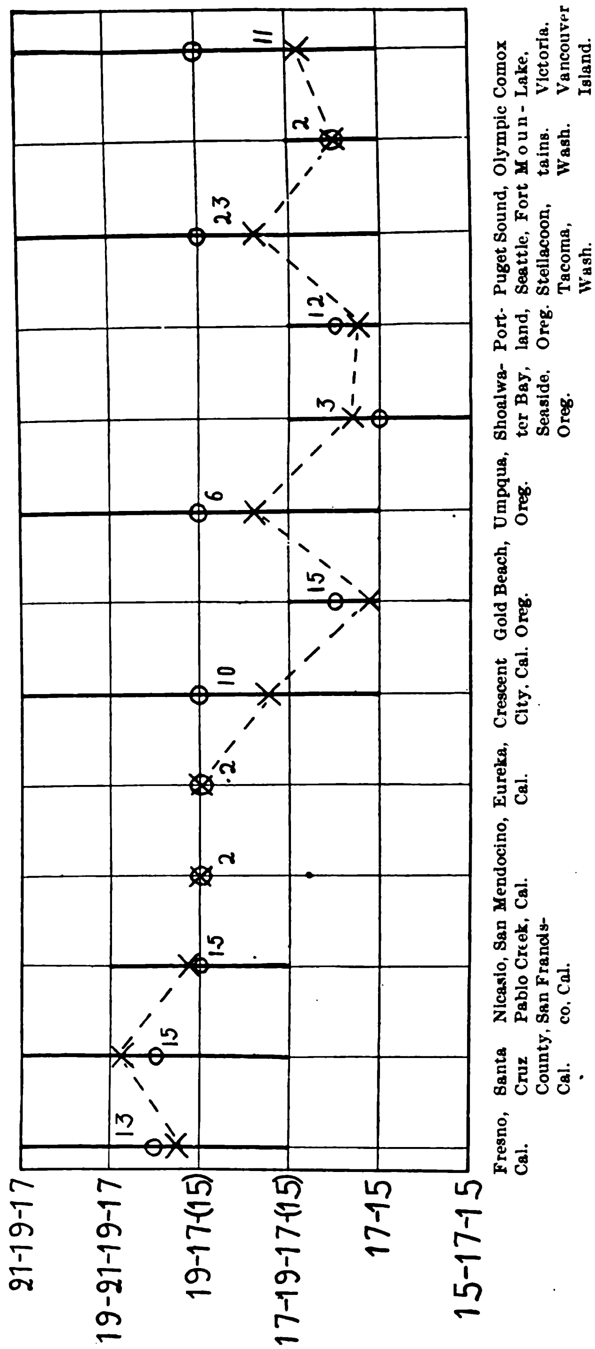


FIG. 63.—DIAGRAM SHOWING THE VARIATION IN THE DORSAL SCALE FORMULA IN THAMNOPHIS ORDINOIDES

diagram further shows that there is a considerable range of variation in this character, the extremes approximating those for the genus,

for the formula 15–17–15, occasionally exhibited, is the lowest, while the highest, 21–19–17, is next to the highest in the genus. The averages, however, reveal a most pronounced tendency toward a formula less than 19–21–19–17. The average formula for California specimens south of Eureka, California, is about 19–17, while north of this point in California, Oregon, and Washington the average for different localities falls between 17–19–17–(15) and 17–15, although in the Puget Sound series the mean approaches 19–17.

The variability of the dorsal scale formula is paralleled in the labials. Thus, the supralabials may be 6, 7, or 8, the infralabials 7, 8, 9, or 10. When the averages are taken, however, (figs 64–65), the formula is seen to be reduced. This is less noticeable in the case of California specimens from localities south of Eureka, in which the average is nearer 8/10 than a lower formula, but north of Eureka, as shown by the table, the frequent occurrence of 6 supralabials and 7 or 8 infralabials draws the mean number of supralabials down to about 7, and that of the infralabials between 8 and 9, the number in both series being slightly higher in the series from Puget Sound.

The ventral and subcaudal scutes are also variable, so much so, indeed, that in view of the limited number of specimens examined we can only expect approximate results in the averages. When the larger series are plotted (figs. 66–67), however, the results are strikingly similar to those of the dorsal and labial scutes. Thus, the mean number of ventrals for localities south of Eureka is between 156 and 162, the subcaudals between 76 and 83, while north of Eureka the average number of ventrals lies between 143 and 152, subcaudals between 61 and 70. Again, in the case of these scutes the number in Washington specimens is highest in the Puget Sound specimens. That the variation in the number of subcaudals is not due to a variation in proportionate tail length is shown by the fact that the latter exhibits no apparent differences throughout the range, and is evidently very nearly, if not exactly, the same as in *elegans*. In the present material the length of the tail varies from .215 (female) to .28 (male), the averages for different localities being between .23 and .26.

Even from the few specimens that it has been possible to examine, the above tables show that *ordinoides* as a form is strikingly dwarfed and that the specimens from the localities north of Eureka and toward the coast tend to have fewer dorsal scale rows, labial plates, ventral and subcaudal scutes than those south of Eureka and toward the Cascade range in Washington. From the present data (fig. 68) *ordinoides* may have either one or two (rarely three) preoculars. From the table it may be seen that the usual number is one and that the occurrence of two preoculars is only occasional. However, the

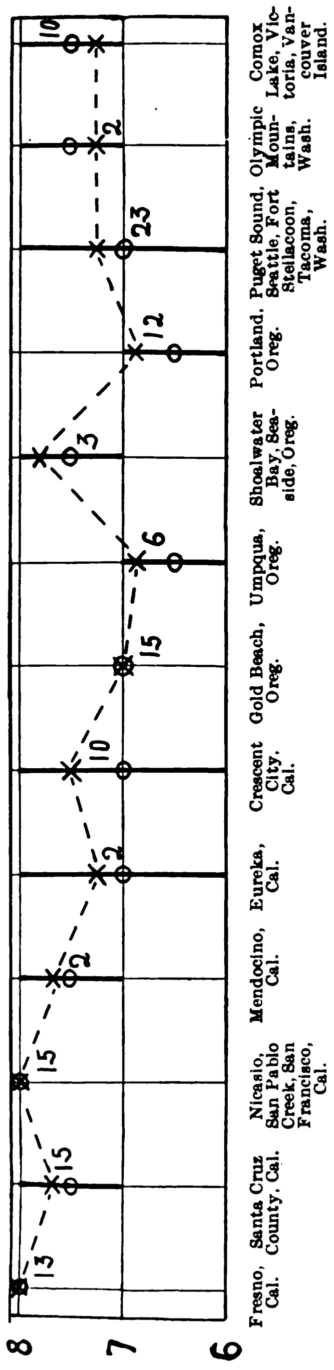


FIG. 64.—DIAGRAM SHOWING THE VARIATION IN THE NUMBER OF SUPRALABIALS IN THAMNOPHIS ORDINOIDES.

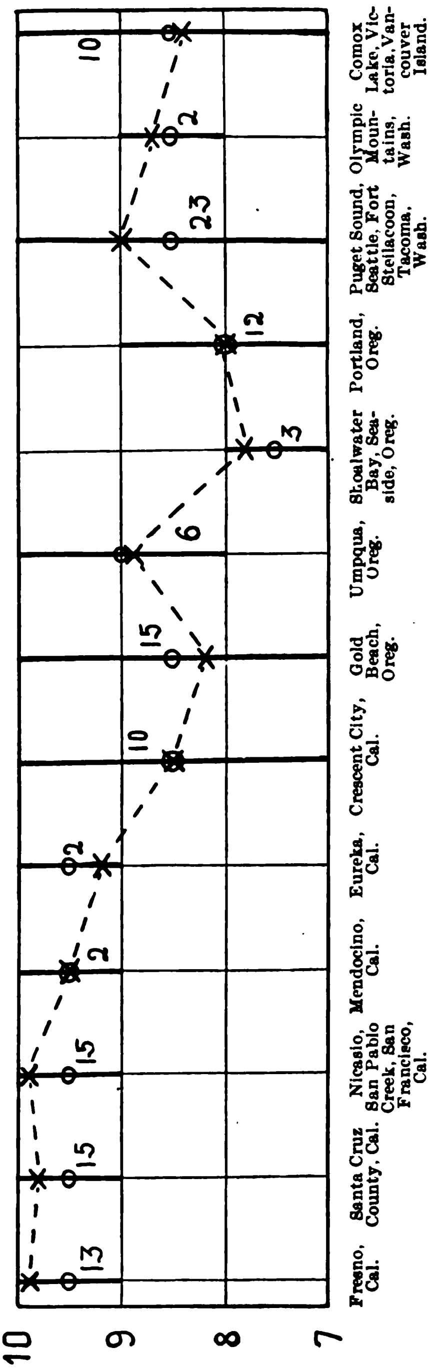


FIG. 65.—DIAGRAM SHOWING THE VARIATION IN THE NUMBER OF INFRALABIALS IN THAMNOPHIS ORDINOIDES.

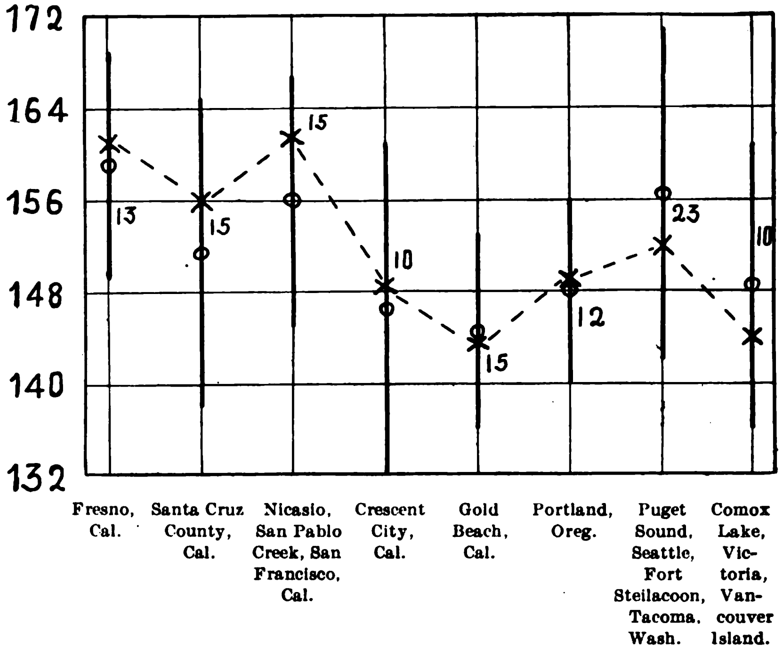


FIG. 66.—DIAGRAM SHOWING THE VARIATION IN THE NUMBER OF VENTRAL SCUTES IN THAMNOPHIS ORDINOIDES.

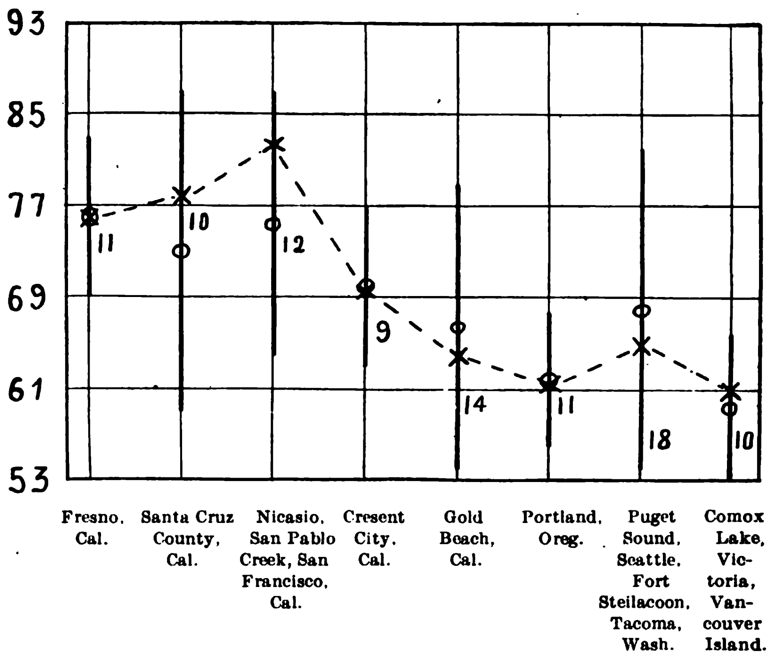


FIG. 67.—DIAGRAM SHOWING THE VARIATION IN THE NUMBER OF SUBCAUDAL SCUTES IN THAMNOPHIS ORDINOIDES.

proportionate number of western Washington specimens with two is greater than in the series from elsewhere in the range, while none of the California specimens exhibit more than one except those from Fresno which have two. It should be stated, however, that two out of seventeen "intermediate" specimens from "Oakland" also have two. Just what this means is difficult to determine, but it is interesting to note that the latitudinal variation in the frequency with which the trait—two preoculars—occurs in *ordinoides* is exactly the same as in *elegans*. For some time writers have been led by the occurrence of this trait to adopt one of two courses: (1) To separate the forms with two preoculars and class them with similar specimens of *elegans* as a distinct form (*biscutata*); (2) to credit the form with having both a single or a double preocular. The first view is untenable, since the specimens with two preoculars are identical with those with one, from the same region, while, as I have shown, the western specimens differ markedly in scutellation from the eastern examples. As I have indicated under the discussion of *elegans*, reliance can not be placed on this character as a diagnostic one, and I believe that the evidence of the other characters shows conclusively that in *ordinoides*, as along the western border of the range of *elegans* and in the intermediate region between the two forms, the occurrence of two preoculars is to be considered as an occasional variation.

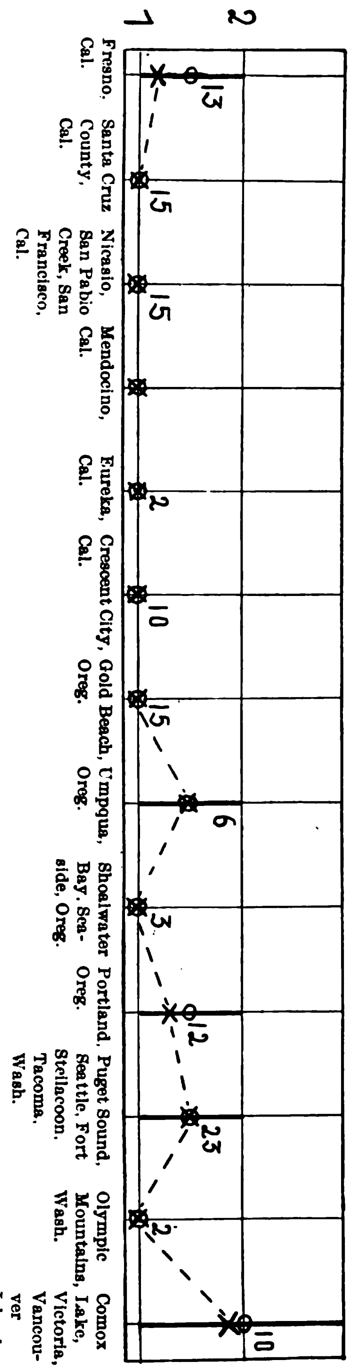


FIG. 68.—DIAGRAM SHOWING THE VARIATION IN THE NUMBER OF PREOCULARS IN THAMNOPHIS ORDINOIDES.

The color is variable, and so much so that it is difficult to determine to what extent the differences are geographic. Nevertheless I believe that the material at hand indicates a generally paler color in the

specimens from the most western (coast) localities. The most usual color is brown with red markings on the scales; stripes greenish, yellowish or red, the lateral on the second and third rows, the dorsal on more or less of the median three.[a] On the coast in California, however, specimens are found that have a light olive ground color, no lateral spots visible on the scales, lateral stripes wanting, and a wide, yellow, dorsal stripe. This lighter color phase thus accompanies the reduced scutellation, a fact which has several times led to the description of such specimens as separate species or subspecies (*atrata* Kennicott and *vidua* Cope). They are, it is true, rather unique with their light color and reduced scutellation, so that, ignoring the variations in these characters, they might easily be considered distinct. Brown's hypothesis that such individuals represent mutations is perhaps excusable on this ground, but with the series before me I can see absolutely no reason for considering them distinct. In the first place, all gradations occur in the same locality between so-called *atrata* specimens, with no lateral stripes and a uniform ground color of pale olive, and darker specimens with distinct lateral stripes, while in the second place a tendency toward the same coloration is evident along the western coast from Santa Cruz County, California, to the Olympic Mountains in Washington. Van Denburgh (1897, 209) states that such specimens occur "nowhere else but on the coast slope of the San Francisco peninsula." That this is a mistake is shown by an apparently typical example from as far north as Crescent City, California, in the Field Museum. This specimen is a typical "*atrata*" except that the dorsal stripe is red and rather narrower than usual. It is true that no typical "*atrata*" specimens have been found in Oregon and Washington, but this may be attributed to the fact that the specimens from this general region are, as a rule, very dark, nevertheless the two Mount Olympic specimens in the Field Museum, described by Meek (1899, 235–236) as *leptocephalus olympia* and *rubristriata*, approach very closely to this type of coloring in being uniformly olive and having the stripes indistinct or wanting.

As a rule, however, the ground color of the Oregon and Washington specimens are darker than those from California. At first sight this fact, together with the reduced scutellation of the former, might seem to indicate that we are here dealing with two forms, but as the differences between the two sections are slight, of degree only, and far from constant, I can not consider them sufficient grounds for dividing the form as I understand it.

Affinities.—Owing to the position of the lateral stripe upon the second and third rows, *ordinoides* can be classed only with the *Sirtalis*

[a] This is the *T. infernalis* of Baird and Girard, Cope, and later writers. The red may also occur in the specimens which are intermediate between *elegans* and *ordinoides*.

or *Elegans* groups. I believe that I have proven conclusively in the discussion of the two forms that *ordinoides* and *elegans* are not only closely related but that they actually intergrade. This relationship has been more or less recognized as far as the California (*elegans*) section of the former is concerned for a considerable number of years, but the Oregon and Washington section has often been considered as a distinct species. To class this part of the form with *sirtalis*, as has been done several times, for the reason that the two forms agree in having 19 scale rows and 7 supralabials, is absurd. In the first place, *the recognized members of the Sirtalis group in this part of North America never have more nor less than 19–17 scale rows, 7 supralabials and one preocular, while ordinoides exhibits both more and less than this number of scale rows, and frequently more than one preocular, so that, while the latter is evidently a dwarfed offshoot of some form, the parent stock must have been one with more than 19–17 scale rows and 7 supralabials.* In the second place, an undoubted form of the *Sirtalis* group occupies almost exactly the same region and probably also the same habitat as *ordinoides*, which opposes the evidence of a closer relationship between *ordinoides* and the *Sirtalis* group.

Its affinity with *elegans*, on the other hand, is shown by the fact that the scutellation and color pattern of *ordinoides* becomes practically identical with *elegans* as the range of the latter is approached, the similarity in the scutellation being brought about by an increase in the number of scales in the dorsal, labial, ventral, and subcaudal series, and by the occasional presence of two preoculars. The resemblance expressed by the similarity in these traits becomes so close in the intermediate region that specimens can not be referred exactly to either form. We believe the conclusion is unavoidable, therefore, that *ordinoides* represents the geographic extreme of the *Elegans* group in North America. If this is true it is interesting to note that it is by far the most dwarfed form among the North American members of the group.

CONCLUSION.

If it be granted from the evidence produced above that *angustirostris*, *melanogaster*, *scalaris*, *phenax*, *hammondi*, *elegans*, and *ordinoides* form a group of genetically related forms (fig. 69), this group is very similar to the *Radix* and *Sauritus* groups above described in that (1) the form with the largest scutellation occurs on the northern part of the Mexican plateau; (2) both to the north and south of this center of maximum scutellation a decrease in the number of scales in each series takes place; (3) in North America the group enters a region that is without effective physical barriers to its northward extension and extends as far to the northward as the increasing

coldness of the climate will permit; (4) the smallest size and scutellation is found in the form that constitutes the distal end of the line of genetically related forms; (5) the intermediate region between the forms is narrow in every case, showing that the change in scutellation takes place rapidly. Again, if the relationships are as I have pointed out, there is a remarkable case of convergent evolution in this group. This is shown by the great similarity in scutellation between *scalaris* and *ordinoides*. If it were not for the peculiar color pattern of the former, it would be impossible without a knowledge of the locality to distinguish specimens of these forms.

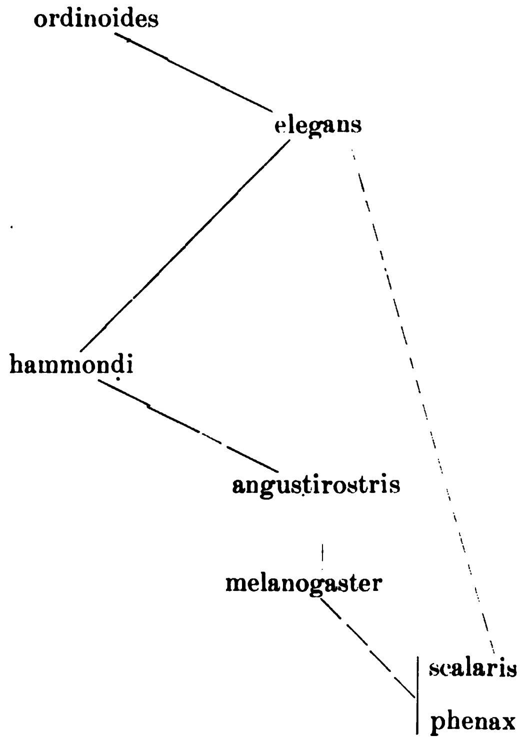


FIG. 69.—PHYLOGENETIC DEVELOPMENT OF THE ELEGANS GROUP.

THE SIRTALIS GROUP (EQUES, SUMICHRASTI, PARIETALIS, SIRTALIS).

EQUES.[a]

Description.—As in the case of all of the other groups, the maximum scutellation for the *Sirtalis* group (as I have defined it) is exhibited by a species which has its principal distribution on the Mexican plateau. This form is the *Coluber eques* of Reuss, the *Eutaenia cyrtopsis* of Ken-

[a] *Thamnophis eques* (REUSS), Mus. Senckenb., I, 1834, pp. 152–155. Includes *E. cyrtopsis* KENNICOTT, *Thamnophis cyrtopsis cyclides* COPE, *Tropidonotus collaris* JAN, *E. cyrtopsis ocellata* COPE, *E. eques aurata* COPE, *E. pulchrilatus* COPE, *E. dorsalis* BAIRD and GIRARD, and *E. ornata* BAIRD and GIRARD.

nicott and later writers, *Tropidonotus collaris* of Jan, etc. It is a very distinct form and has seldom been confused with others. In every specimen examined the lateral stripe is on the second and third rows of scales, and the dorsal stripe is, as a rule, confined to the median row for the greater part of the length, although it is usually wider on the nape and occasionally occupies more or less of the adjacent rows on the body. The dorsal scale formula is nearly always 19–17, rarely 19–17–15 or 17–19–17. The supralabials are 7 (often), 8 (usually), 9 (frequently), or 10 (rarely); the infralabials are usually 10, occasionally 11, rarely 8 or 9. The oculars may be 1–2, 1–3, 1–4. Ventral scutes 144 (female) to 180 (male). Subcaudals 66 (females) to 97 (males). Proportionate tail length .204 (female) to .292 (male).

The ground color between the stripes is light brown, inclining either to olive or red, and the keels are usually appreciably redder than the rest of the scale. The lateral stripes vary in color from creamy white to light yellow; the dorsal is generally light orange yellow.

The first row of scales is ordinarily light or dark ash, with occasional, paired dark marks at intervals on the upper and lower edges of the scales, the lower mark including the end of the ventrals. In some instances these marks are represented by a single series of spots, each one of which involves the end of a ventral scute and the first and more or less of the second rows of scales, thus encroaching on the lateral stripe and giving it a wavy appearance. There are always two distinct rows of quadrate black spots between the stripes, and these are generally about one and one-half scales wide, and the same distance apart, the interspaces being bluish white. (According to the descriptions of "*dorsalis*" and "*ornata*" specimens the interspaces in Texas and New Mexico specimens may be red.) These spots are on the skin, and are usually represented only on the extreme edges of the involved scales, except anteriorly, where they are represented by a pair of large conspicuous nuchal blotches which cover all of the included scales with the frequent exception of the keels, which often retain their reddish color. The edges of the scales in the interspaces are usually white.

While the arrangement of the spots described above applies to most of the individuals of *eques* that have been examined, it does not include a number of specimens in which the spots show a decided tendency to encroach upon the involved scales forming spots similar to those on the skin (*ocellata* Cope and *collaris* Jan). In such specimens (and these are usually those in which the first row of spots, below the lateral stripe, is better developed) the encroachment of the black pigment upon the scales is generally more pronounced anteriorly. Indeed, it is not uncommon to find individuals with the spots well marked on the scales of the anterior part of the body, but entirely absent posteriorly. Even when distinct on the scales, however, the

black pigment does not always encroach upon the keels, which frequently retain their characteristic rufous tint; but when well developed they often encroach upon the dorsal and lateral stripes, giving them a wavy or interrupted appearance. In a number of specimens which have been examined (mostly from the northern part of the range, see below) the spots in the second and third rows fuse on the anterior part of the body to form distinct cross-bands between the stripes, occasionally also uniting with those of the first row, thus intersecting the lateral stripe. This tendency has not been noted to take place for more than seven spots posterior to the nuchals, which in these specimens are usually fused across the nape and strongly notched posteriorly by the dorsal stripe.

Belly grayish white, light yellow or light greenish yellow. The usual narrow, black bar, and ventral spots may occur alone or together, but in any case rarely show much beyond the edges of the superincumbent scute. The ventral plates are rarely speckled with darker. The head above is usually dark brownish olive splashed with black. The supralabials (with the exception of the last), lower and middle postoculars, and the lower part of the preoculars are usually pale yellow; supralabials well margined with black. The last labial is usually more dusky, approaching the body color. Generally many of the infralabials are also margined with black.

Habits and habitat relations.—Apparently the only observations that have been recorded upon the habitat preference of this snake are those on the three specimens taken in Sabino canyon, Santa Catalina Mountains, Arizona, in 1907 (Ruthven, 1907, 588). "All of the specimens obtained were found near the stream in the canyon. Two were lying on rocks in midstream, the other on the immediate shore. When frightened they immediately took to the water, swimming in the swift current with apparent ease. They doubtless subsist largely upon the frogs and tadpoles which abound in this habitat." Bailey records it in the Davis Mountains, Texas, at an altitude of 5,700 feet.

Range.—*T. eques* is known to range over more degrees of latitude than any other garter-snake that inhabits Mexico, except *proximus*. The range extends from central Guatemala on the south to the high plateau in central Arizona and New Mexico on the north. Specimens have been examined from the following localities: "Central Guatemala," Escuitla, Guatemala; valley of Mexico and Toluca, Mexico; Veracruz, Zacaultipan, Hidalgo; Guanajuato; Rinconado, Puebla; Durango and Coyotes, Durango; Fort Apache, Fort Huachuca, White River Canyon, Sabino Canyon (Santa Catalina Mountains), Fort Whipple, Arizona; San Ildefonso, Lake Valley, New Mexico; Davis Mountains, Pecos, Helotes, San Antonio, Texas.

The literature on this form is rather extensive, but, as far as I can find, no specimens have been recorded outside of the region outlined

by the above localities, except the specimens listed by Boulenger (1893, 209) from Jalisco and Guerrero and the specimen said to have been taken by Xantus at Cape San Lucas, Lower California. I have elsewhere shown (Ruthven, 1907, 588–589) that there is undoubtedly a mistake in the latter record, in that the specimen upon which

FIG. 70.—DISTRIBUTION OF THAMNOPHIS EQUES, AS INDICATED BY THE LOCALITY RECORDS.

it was based very probably came from Arizona. As known at present, then, the range of *T. eques* may be defined in general as all of Guatemala, Mexico exclusive of the coastal plains, the Proplateau region of southern Arizona and New Mexico, and the high plateau region in the last two named States and western Texas (fig. 70). The

specimens in the U. S. National Museum labeled "Helotes" and "near San Antonio," Texas, seem to indicate that it also occurs in the prairie region of central Texas, but as these localities are near the margin of the high plateau the range of the species can not be extended into the prairie region until notes on its occurrence in this region are at hand. Just how far north it extends is questionable, but the San Ildefonso specimens show that it attains the high plateau region in New Mexico, which might be expected, since it occurs in the mountains in the Proplateau region (Bailey, 1905, p. 48; Ruthven, 1907, 588–589). Similarly its northern limit in Texas also remains to be determined.

Variation.—Naturally in such an invariable form it is difficult to discover geographic differences in any but large series of specimens. Some differences appear in the material examined, however, which seem to be associated with definite parts of the range. In the diagrams (figs. 71 and 72) I have plotted the variations and mean number of dorsal scale rows and supralabials for various localities throughout the range.

It is readily granted that the number of specimens employed in the tables is inadequate to furnish conclusive results in an investigation of the geographic variation in this form, and yet, in view of the narrow limits of variation, I believe that the tables are not deceptive in indicating a slight decrease in the number of dorsal scale rows and supralabial scutes in southern Mexico and Central America. The individual variation is too great in the case of the infralabials, ventral and subcaudal scutes to insure accurate results when the available data is tabulated, but I believe when more material is available that the evidence of these characters will not vitiate the evidence of the dosal scale rows and supralabial plates that there is a reduction in scutellation in the region mentioned. The tendency toward a reduction in the number of dorsal scale rows in the southern part of the range is shown in the occurrence of the formula 19–17–15 and 17–19–17–15 in specimens from this region, which brings the average below 19–17; while similarly the decrease in the number of supralabials in the same general region is shown in the frequent presence of 7, a number which is not shown in any specimens north of the State of Durango. The latter fact justifies me at once in relegating Cope's species *pulchrilatus* (1885 b 174) to the synonomy of *eques*, as this form was based entirely upon specimens of *eques* with 7 supralabials. Cope (1900, 1062) objected to this disposition of the form by Boulenger with the statement that it "belongs to a different section of the genus." He neglects to mention, however, which "section" it is to be referred to, and there is no other evidence besides the number of supralabials that I can find to separate it from *eques*.

The limits of variation in the ventral and subcaudal scutes and tail length have already been given. The averages for the larger

series in which males and fėmales are represented in about equal proportions are about as follows: Ventrals, 160–170; subcaudals, 75–85; tail length, .23; but much larger series are necessary to properly define these characters.

As in the case of scutellation, there is little marked variation in the coloration. However, the specimens in which the dorsal spots

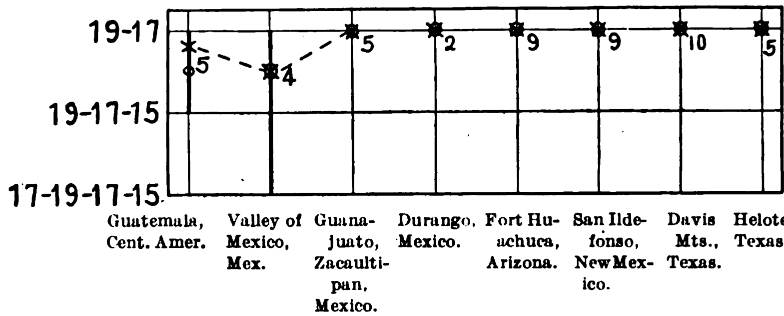


FIG. 71.—DIAGRAM SHOWING THE VARIATION IN THE DORSAL SCALE FORMULA IN THAMNOPHIS EQUES.

tend to become distinct on the scales and fused into cross-bars anteriorly (see p. 159) are principally from the southern part of the United States. Cope (1880, 22–23) has described these as a distinct variety *ocellata* (and Jan has made them the basis of the species *collaris*). This pattern is found in occasional specimens from nearly every

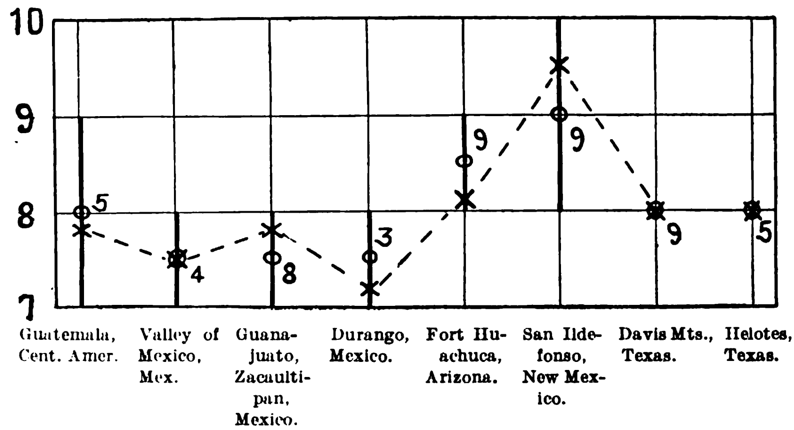


FIG. 72.—DIAGRAM SHOWING THE VARIATION IN THE NUMBER OF SUPRALABIALS IN THAMNOPHIS EQUES.

locality in the range of *eques*, and while of more frequent occurrence in the northern part still occurs only as an individual variation of the normal coloration. In regard to the loss of the stripes, the case is somewhat different. Thus, in the series in the U. S. National Museum from Zacaultipan, Hidalgo, Mexico, out of six specimens three are typical, *eques*, and the others, while agreeing with them in scutellation, differ in the apparent total absence of lateral and dorsal stripes.

The latter three specimens have been referred by Cope to *sumichrasti*, and conform closely to the original description of that form. Inasmuch, however, as it is impossible to work out the dorsal scale formula of the type (owing to its poor condition) the identity of the Zacaultipan specimens with them can not now be determined. The species was described, however, from specimens from Orizaba, Mexico, and credited with 19 scale rows, which probably means the maximum number, and since specimens from that locality have generally a more reduced number of dorsal scale rows (although the maximum is frequently 19) and a similar coloration, the types of *sumichrasti* are undoubtedly identical with such specimens which are to be referred to a different form. I believe the specimens from Zacaultipan, without stripes, can be considered only as variations of *eques*, which possibly indicate that the form tends to lose the stripes in this region.[a]

Affinities.—If I have proven that there is a tendency toward a reduction in the dorsal scale formula below 19–17, and toward the obscuring of the stripes, the only objection to the conclusion that *eques* is very closely related to the following form (*sumichrasti*) has been eliminated. As will be shown in the description of the latter, there are no appreciable differences between so-called *sumichrasti* specimens from Orizaba, Veracruz, and typical *eques* except in the slightly larger number of scale rows of the latter; a discrepancy that entirely disappears when it is noticed that in the intermediate region, geographically, the scutellation of *eques* tends to become apparently exactly that of *sumichrasti*. On the north we believe that it is directly related to *parietalis* (see p. 172).

SUMICHRASTI.[b]

Description.—I use this name to designate those specimens, so far recorded only from southern Mexico, that otherwise combine the usual coloration of *eques* with a reduced scutellation and the usual absence of the dorsal stripe.

---

[a] I can find absolutely no character in which the types and only specimens of *Eutaenia aurata* Cope (1892, 659–660) and *Thamnophis cyrtopsis cyclides* Cope (1862, 299) differ from typical *eques* specimens.

[b] *Thamnophis eques sumichrasti* (Cope), Proc. Acad. Nat. Sci. Phila., 1866, p. 306. Includes also *E. chrysocephala* Cope and *Tropidonotus godmani* Günther. I use this name advisedly. As before stated, the types of *sumichrasti* are in very bad condition, but they are apparently very similar in coloration to so-called *chrysocephala* specimens from the same region. Cope always distinguished the former as having 19 scale rows and the latter as having 17, but since typical *chrysocephala* specimens with 17–19–17 scale rows are found in Veracruz, the distinction is not a sufficient one. Since also both forms are characterized by the usual obscurity of the dorsal stripe, I feel justified in concluding that it was upon specimens of this kind that Cope based his description of *sumichrasti*, which name should, therefore, be the name of the form. *Tropidonotus godmani* was evidently based on a specimen of this form with a dorsal stripe.

The writer has seen but eleven specimens of this form (inclusive of the damaged types of *sumichrasti*), but these are so uniformly unique that he has no hesitancy in giving them the rank of a form The lateral stripes are generally present, although occasionally not very distinct, and are in every specimen on the second and third scale rows anteriorly, but generally only on the second posteriorly. The dorsal stripe is usually absent, although occasionally present for a short distance anteriorly, more rarely for the entire length. Coloration otherwise much as in *eques*, the ground color being brownish with lighter keels, and the lateral spots little evidenced upon the scales, except anteriorly, where they form a pair of distinct nuchals and occasionally one or two large transverse blotches between the stripes. The scutellation has been summarized in the following table:

Scutellation of Thamnophis sumichrasti Cope.

No. U.S. N. M.	Locality.	Dorsals.	Supralabials.	Infralabials.	Oculars.	Ventrals.	Subcaudals.	Total length.	Tail length.	Proportionate tail length.	Remarks.
								mm	*mm*		
26501	Orizaba, Mexico	(?)	8	9	1-3	(?)	(?)	(?)	(?)	(?)	Type.
26502	.....do..........	(?)	8	(?)	1-3	(?)	(?)	(?)	(?)	(?)	
7077	....do..........	17-15	8	9	1-3	147	(?)	(?)	(?)	(?)	
7077a	.....do..........	17-15	8	10	1-3	149	(?)	(?)	(?)	(?)	
7077b	.....do..........	17-15	8	10	1-3	155	(?)	(?)	(?)	(?)	
7077c	.....do..........	17-15	8	8 10	1-3	149	76	496	126	0.254	
7077d	.....do..........	17-15	8	9 10	1-3	147	74	425	108	.242	
7077e	.....do..........	17-15	8	10	1-3	152	83	223	55	.246	
7077f	.....do..........	19-17-15	8	10	1-3	155	(?)	(?)	(?)	(?)	
30494	.....do..........	17-15	8	9 10	1-3	153	80	530	136	.256	Type of *chrysocephala*.
30496	.....do..........	17-19-17-15	8	10	1-2 1-4	154	(?)	(?)	(?)	(?)	

As shown from this table, the form *sumichrasti* as now known is characterized by a small dorsal scale formula, and exhibits an apparent tendency toward a smaller number of infralabials than 10, and possibly also a smaller number of ventral plates than is usual in the larger members of the genus. The tail length as far as shown by the material is similar to that of most of the forms exclusive of those of the *Sauritus* group.

Range.—The only specimens of *sumichrasti* that I have seen are from Orizaba, Veracruz. Boulenger (1893, 203) records specimens of *chrysocephalus* from Omilteme and Amula, Güerrero, Günther (1894, 133) specimens of *godmani* from the same localities, Bocourt a specimen of *sumichrasti* from Coban, Guatemala, and Cope a specimen of *sumichrasti* as possibly from "the Plateau of Costa

Rica at Cartago." Needless to say the dorsal scale formula of these specimens should be carefully examined to make sure that they are are not *eques* specimens with obscure stripes. As already stated, it seems advisable to refer to *eques* the specimens from Zacaultipan, Hidalgo, determined as *sumichrasti* by Cope.

Affinities.—As already mentioned under the discussion of *eques*, I believe that these two forms are directly related. They are remarkably similar except for the smaller dorsal scale formula and usual obscurity of the dorsal stripe in *sumichrasti*, and since I believe it demonstrated that there is a tendency toward a reduction in the number of dorsal scale rows and an obscuring of the stripes in *eques* in southern Mexico, there can be no objection to considering the individuals from Orizaba, Mexico, as representing the continuation of this process. The form apparently lies entirely without the province of *eques*, and intergrades with the latter through such specimens as the ones from Hidalgo, valley of Mexico, etc., referred by Cope to *sumichrasti* and *pulchrilatus*. Just where the intergradation occurs can not now be determined, but it should be noted that the difference in the number of scale rows must be brought about in quite a narrow area, since the formula 19–17 is quite constant in *eques*, even in the States of Hidalgo and Mexico, where it comes close to the range of *sumichrasti*.

PARIETALIS.[a]

Description.—This form is so well defined that it has seldom been confused with any other, and has avoided the fate of so many other forms, i. e., being broken up into a number of subspecies. The dorsal scale formula is always 19–17; the supralabials usually 7, frequently 8, but very rarely 6; the infralabials usually 10, occasionally 9, more rarely 11, and very rarely 8; the ventral scutes 150 to 178; subcaudals 65 to 92; tail length .202 to .32.

The general coloration is as follows: Ground color above dark olive to brownish olive or dull reddish brown, the color being confined to the scales between, and the keels of the scales involved in, the lateral spots. The latter are arranged in two rows on the skin between the lateral and dorsal stripes; occasionally the spots in both rows distinct, but those of the upper row usually fused for more or less of their width to form a black band, the spots of the lower row appearing as downward projections from this band. The black pigment of the spots only encroaches upon the edges of the involved scales. The interspaces on the skin vary from orange to red, and this pigment nearly always encroaches on the edges of the involved scales. The first few

[a] *Thamnophis sirtalis parietalis* (Say), Long's Exped. Rocky Mts., I, 1823, p. 186. Includes *Eutænia sirtalis trilineata* Cope (part), *E. sirtalis tetratænia* Cope (part) (see also p. 176), and *E. sirtalis dorsalis* Cope (not *E. dorsalis* Baird and Girard; see p. 158).

spots anteriorly of the two series may fuse to form transverse blotches between the stripes. The dorsal stripe is on the median and halves of the adjacent rows and with the lateral stripes may be bright orange yellow, bright yellow, various shades of greenish yellow, or bluish. The first row is usually sufficiently darker to define the lateral stripe below, but this is not always the case. The belly may be grayish, greenish, or bluish. The better marked variations from the normal type will be considered under "variation."

Habits and habitat relations.—Few definite observations have been recorded on the habits of this form. Stomachs examined frequently show specimens of the leopard frog (*Rana pipiens*), and Taylor (1892, 325) writes that in Nebraska "specimens of this garter, not exceeding two and one-half feet in length almost always contain within their stomachs specimens of the common earthworm." Specimens in captivity will eat both frogs and toads voraciously.

In northern Iowa *parietalis* is rather rare. On a two months' collecting trip in Clay and Palo Alto counties, July and August, 1907, an expedition from the University of Michigan Museum obtained but three specimens, although a careful search was made for them. Of these two were found on the immediate edge of large sloughs (fig. 23), the third in a rather swampy swale on the prairie. We have also, however, taken a few specimens in the long grass on the uplands in this region (fig. 24), but they are apparently very rare in this habitat. Another specimen was taken on the bank of a small creek near the Missouri River, in Woodbury County, Iowa. One of the specimens taken in Palo Alto County in 1907 was a large female, and on September 30 gave birth to seventy-three young.

Range.—It is rather interesting that, although *parietalis* has been well known for many years, the limits of its range can nowhere be established at present except on the west. Its range is greater than that of any other known garter-snake and includes a number of biotic regions. It may be said in general to extend from the western part of the "prairie peninsula" in Iowa to the Cascade range in Oregon, Washington, and British Columbia, and to the Pacific coast in California, and from northern New Mexico into Canada. Undoubted specimens have been examined from the following localities: Menlo Park, Fort Reading, Pitt River, San Francisco, Petunia, Fort Crook, Fresno, Crescent City, Tomales Bay, Petaluma, Eureka, Yosemite Valley (altitude 4,000 feet), Palo Alto, Camp Bidwell, California; Gold Beach, Des Chutes River, Dalles, Warners Second Lake, Oregon; Cheney, Pullman, Fort Walla Walla, Washington; Sicamous, Nelson, Kaslo, Donald, British Columbia; Lake Tahoe, Camp 10 and 12 (Ridgway), Nevada; Carson Valley, Logan (10 miles east of), Utah; Fort Collins, Denver, Greeley, Colorado; Flathead Lake, Swan Lake, Fort Benton, Bitter Root Mountains, Billings, Fort Custer, Three

Forks, Fish Creek, Montana; Peabody, Onaga, Fort Riley, Fort Harker, Kansas; Platte River, Fort Kearney, Nebraska; Ames, Des Moines, Palo Alto County, Clay County, Woodbury County, Iowa.

Further collecting will extend the range somewhat beyond the extreme points listed above, to the north, south, and east. At present the most debatable territory is to the south and east, for here *parietalis* meets two allied forms (*eques* and *sirtalis*), which it resembles so closely that it is impossible to distinguish preserved specimens with certainty. This is true of specimens from northern New Mexico and Arizona, and Minnesota, eastern Iowa, and western Illinois. The points of resemblance between these forms will be discussed under "variation," but it should be stated here that no reliance can be placed upon the published lists which record *parietalis* for any of the last named States. Thus, Cope records it from Lake Valley, New Mexico, but the basis of the record proves on examination to be a specimen of *eques*, while apparently several of his *dorsalis* specimens from the same state, as well as Garman's Illinois specimens and Ruthven's Isle Royale specimens (1906, 111–112), are not at all typical and are mostly to be considered "intermediate." At the present time the eastern limit of typical *parietalis* may be given very generally as the "prairie peninsula" in central and southeastern Minnesota, eastern Iowa, and northeastern Missouri. The southern limit in central United States can not even be approximated, although it doubtless lies in the northern part of Texas, Arizona, and New Mexico. The southernmost point from which we have examined specimens from California is Fresno, but Van Denburgh (1897, 203) records it from "San Bernardino (Ontario) and Riverside (Riverside) counties," and Grinnell (1907, 49) from the Pacific slope of Los Angeles County. The known range has been platted on the map (fig. 73).

Variation.—Like its relatives, *eques* and *sirtalis*, *parietalis* is little variable in scutellation. Large series alone, therefore, will reveal geographic differences if they exist. Unfortunately, while I have examined about three hundred and fifty specimens, these have been from many localities, so that single regions are represented only by small numbers. On the other hand, in view of the constancy of the characters, geographic variations must be very slight, and I believe that the data accumulated is quite representative of the actual conditions. In every specimen in which they were counted (311) the dorsal scale formula is 19–17. In regard to the labials, the suites are all alike in that most of the specimens have the labial formula 7/10, but quite frequently 8 supralabials and 9 or 11 infralabials. I have seen but four specimens in which the variation exceeded this amount, one from Eureka, California (Field Museum, 1111), and three from Pullman, Washington (Ruthven collection), each of which

have 8 infralabials on one side, and one from Pullman, Washington (Ruthven collection, No. 11), which has 6 supralabials on one side.[a]

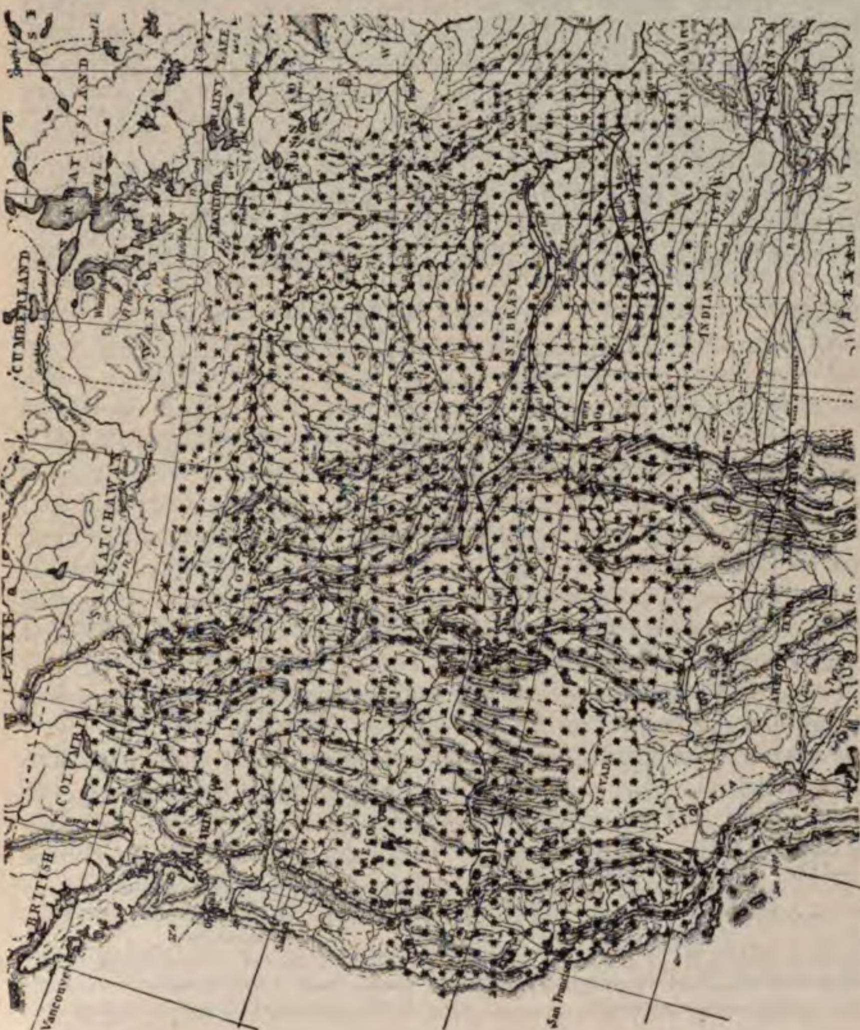


FIG. 73.—DISTRIBUTION OF THAMNOPHIS SIRTALIS PARIETALIS, AS INDICATED BY THE LOCALITY RECORDS.

The extent of the variation in the labial formula may be seen in the diagram (figs. 74–75), for the Montana specimens. The conditions

[a] It is worth recording here that a female from Pullman, Washington, which the writer kept in captivity, and which had a labial formula 7/10, gave birth to eleven young none of which had more than 9, while three had 8 infralabials on one side, and none had more than 7, and one had 6–7 supralabials. There is, in regard to the labials, more reduced specimens in this brood than in the series from any other locality. The difference is not geographic, as six specimens from Walla Walla have 7/10, with one exception, in which there are 9 infralabials on one side. All that can be said is that the cause that brought about the reduction apparently affected the entire brood.

represented in these diagrams are typical for every locality examined, as far as can be judged from the material at hand.

The ventral scutes vary as follows: Females, 150–165; males, 153–178. The average for thirteen specimens from California (west of the Sierra Nevadas) is 161, for twenty Montana specimens, 163.7. The subcaudal plates vary as follows: Females, 65–80; males, 73–92; average number for twelve specimens from California, 82; for thirteen specimens from Montana, 81.3. The material at hand is not sufficient to throw much light upon the proportionate length of tail. The extremes are .202–.262 (female), .239–.32 (males). The average for different localities with more than twelve specimens falls between .23

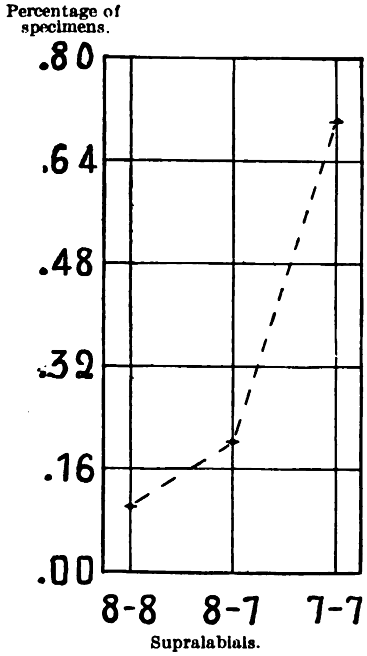


FIG. 74.—VARIATION IN THE NUMBER OF SUPRALABIALS IN 20 SPECIMENS OF THAMNOPHIS SIRTALIS PARIETALIS FROM MONTANA.

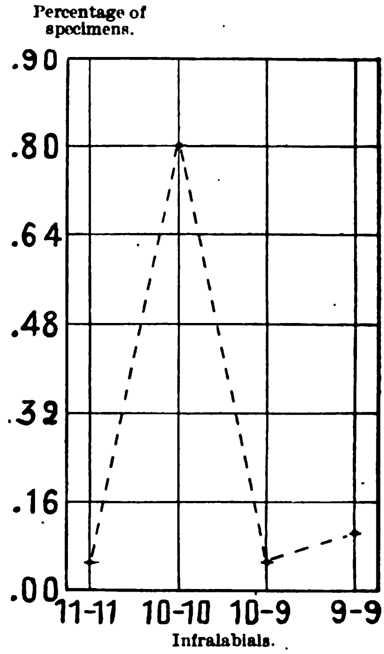


FIG. 75.—VARIATION IN THE NUMBER OF INFRALABIALS IN 20 SPECIMENS OF THAMNOPHIS SIRTALIS PARIETALIS FROM MONTANA.

and .25, but to what extent these averages are constant throughout the range is a question which awaits investigation.

The more striking variations in color in *parietalis* are principally in the way of modifications in the arrangement of spots, the intensity of the ground color, and the color of the interspaces on the skin. It should be recalled that the usual coloration is: Ground color, olive or reddish brown; upper row of spots fused on skin; interspaces about one scale wide and red in color; dorsal stripe on the median and halves of adjacent rows. The variations are as follows:

(1) Ground color above, black; interspaces, narrow (from three-fourths to one-half the width of a scale); dorsal stripe on the median

and halves of the adjacent rows. Such specimens are characterized only by the slight excess of black pigment. We have seen this color phase only in specimens from western Montana (Fort Benton, Flathead Lake, Three Forks, Bitter Root Valley) and the west slope of the Rocky Mountains in southern British Columbia. It was principally on *parietalis* specimens of this type that *E. sirtalis trilineata* Cope (1892, 665) was based, but the characters are not sufficient to warrant the separation of these specimens from *parietalis*. They are indistinguishable from some specimens of *concinnus* (see p. 176).

(2) Quite often in typical *parietalis* specimens the red pigment of the interspaces shows a tendency to encroach upon the black areas, particularly between the fifth, sixth, and seventh scale rows, to the partial or total separation of the lower row of spots from the upper black band. This is not at all remarkable, since it is these scale rows which mark the limits of the spots in garter-snakes which have the two rows distinct. In two specimens from Pitt River, California (Cat. Nos. 21383 and 21384, U.S.N.M.), the separation of the two rows of spots is complete, and a further modification exists in the fact that the lower row of spots, like the upper, has also fused into a longitudinal black band. These specimens have been described as *E. sirtalis tetrataenia* Cope (Yarrow, 1875, 546), but they are, in my judgment, evidently only two anomalous specimens of *parietalis*, and this conclusion is supported by the fact that in one of these specimens (No. 21383) the lower black stripe is partially broken up into spots. A similar pattern is occasionally exhibited by *concinnus* (see p. 176).

(3) A number of specimens of *parietalis* from Kansas and Minnesota examined have the first few spots anteriorly fused into transverse blotches between the stripes, as in some Illinois specimens of *sirtalis* described by Cope as *Eutaenia sirtalis semifasciata*, and in the *eques* specimens described by him under the name *ocellata*. This is merely an individual variation, but may have some significance (see p. 173).

(4) By far the most significant variation exhibited by *parietalis* is the breaking up of the lateral black band into the usual upper row of spots. If this alone takes place the result is a coloration practically the same as that of *eques* and *sirtalis*, except that the interspaces are red. We have seen this color phase in Colorado (Greeley) and eastern Kansas (Onaga) and Isle Royale, Michigan, specimens, but it can only be certainly determined in fresh material, for the red of the interspaces fades rapidly in preserved specimens, so that they can not with certainty be distinguished from *eques* (when there are 8 supralabials) and *sirtalis*, the more so that the modification seems to occur only near the ranges of these forms.

In Minnesota, eastern Iowa, and Missouri the proportion of specimens with two distinct rows of spots is large, and the specimens from this region are further characterized by the frequent absence of red pigment on the sides, a character which is also occasionally found in

Kansas and Nebraska specimens. Just what influences the presence of this red pigment can not now be determined, but it is interesting to note that in a series of sixty-five young born in captivity of a typical *parietalis* mother (upper row of spots fused and red interspaces) from Clay County, Iowa, but one showed the least trace of red at birth, and this one but little, showing that the red color may be developed to a large extent after birth, as in most North American birds. Eastern specimens with two rows of spots and red interspaces have been examined from eastern Kansas, eastern Iowa, eastern Missouri, and Isle Royale, Lake Superior. The Colorado and New Mexico material in which specimens with the same arrangement of spots occur were referred by Cope to *dorsalis*.

Affinities.—One need not search far for the relatives of this form. There can be no question but that to the eastward it grades into *sirtalis*, and although, as before stated, typical specimens of *parietalis* may be found as far east as eastern Iowa and *sirtalis* specimens as far west as Kansas, the section of this form which inhabits the entire prairie region (i. e., east of central Kansas and Nebraska) as well as the edge of the adjoining forest region [a] may be considered as intermediate, for in this region the distinctive characters which separate typical *parietalis* (upper row of spots fused and red interspaces) break down.

The presence of specimens in Colorado with two distinct rows of spots is also significant, inasmuch as such individuals are indistinguishable from *eques*, when the red of the sides has disappeared, for we have already noted that *eques* may have 7 supralabials, and apparently shows a tendency to have red interspaces in Texas and New Mexico. This is why it is impossible to define at present the respective southern and northern limits of the two forms, points which can not be settled until their relations are worked out from fresh material. Since, however, in the two forms the scutellation (with the exception of the number of supralabials), proportions, and position of the lateral stripes are approximately the same, while the ranges are at least near together, the evidence seems to indicate a close relationship, and we believe that the similarity in coloration of specimens from near the common boundary is such as to indicate an actual intergrading. As already noted, the number of infralabials is noncommittal in small series, as they may be 7 or 8 in both forms.

Specimens have been examined from as far south as Taos, San Ildefonso, Las Cruces, and Albuquerque, New Mexico, that can be referred to *parietalis*, as well as others from San Ildefonso that are apparently *eques*, but this does not signify that intergradation does not occur. The whole question must await further investigation,

[a] I have elsewhere noted that on Isle Royale, Michigan, which is well within the forest region, most of the individuals are typical *sirtalis* in coloration, but that specimens are also found in which the lateral spots are in two rows and the interspaces bright red.

when fresh specimens shall be available from this region. At present we can only say that the forms are undoubtedly closely related, and belong to the same group.[a] In the northwest *parietalis* meets another form (*concinnus*), with which it is closely allied. The relationship of these forms will next be discussed.

CONCINNUS.[b]

Description.—Doctor Hallowell (1852, 183), in his description of this form, concludes with the remark that it is "The most beautiful of the North American serpents hitherto discovered." His enthusiasm is easily realized by anyone who has the good fortune to see living specimens. The form differs from *parietalis* only in the increased amount of black pigment and the attendant effect upon the pattern. The dorsal scales, including the first row, are generally black, with the exception of more or less of the scales involved in the interspaces, which are red. The stripes may be brightly colored, but are usually yellowish, greenish, or bluish. The lateral when present is on the second and third scale rows, but is frequently absent; the dorsal is generally confined to the median row, but may also cover the halves of adjacent rows or be entirely obsolete. The spots when distinct are arranged as in *parietalis*, i. e., those of the upper row fused, those of the first row distinct from each other but fused with the upper row. The interspaces (always red) are, when present, however, generally much narrower (being only one-half to one-fourth a scale wide) than in *parietalis* and are frequently entirely absent, the skin being solid black. Belly usually dark greenish or bluish, and generally much speckled with black and occasionally orange.

It will be seen from the above description that there is no character which will constantly distinguish specimens of *concinnus* from *parietalis*. The narrow dorsal stripe and lateral interspaces of the former will usually do so, but these may be exactly as in *parietalis*. Still, the fact that nearly all specimens from Washington and northern Oregon, west of the Cascade range, are characterized by a marked predominance of black pigment and a narrow dorsal stripe justifies their recognition as a separate form.

Habits and habitat relations.—As far as I know very little has been recorded on the habits of this snake. Cooper and Suckley (1860, 297) record the following notes:

> This species exists in great abundance near Steilacoon and Nisqually. They are found on the gravelly prairies and in the vicinity of the numerous small lakes of this section of country. About the first of April they begin to come out of winter

---

[a] It is interesting to note that the three forms, *eques*, *parietalis*, and *sirtalis*, all exhibit the occasional tendency toward the fusion of the first few anterior spots into cross-bars.

[b] *Thamnophis sirtalis concinnus* (Hallowell), Proc. Acad. Nat. Sci. Phila., 1852, pp. 182–183. Includes *Eutænia pickeringi* Baird and Girard, *E. sirtalis trilineata* Cope (part), *E. sirtalis tetrataenia* Cope (part).

quarters, and can be seen at midday sunning themselves near small clumps of scrub-oak bushes, to which they retreat when alarmed. A little later they are found in couples or in small companies. Although they are rarely ever found more than one-eighth of a mile from water, they are, nevertheless, still more anxious to be close to it as the season advances. They will then (in May and June) be found lying close to the water, on the lake shores in the grass, and among the sedge of the marshes, and even upon small bog islands, as much as 50 yards from the shore.

In summer, like other members of this genus, they are found lying in small pools and in the water at the edges of the lakes during the heat of the day. They appear to be a harmless, lazy species, and, as above stated, exceedingly fond of the water.

FIG. 76.—DISTRIBUTION OF THAMNOPHIS SIRTALIS CONCINNUS, AS INDICATED BY THE LOCALITY RECORDS.

Range.—The range of *concinnus* is apparently rather definitely bounded on the east and west, since it ranges from the Pacific Ocean to the Cascade range. Specimens which I have referred to *concinnus* have been examined from the following localities: Portland, Eugene City, Oregon; Shoalwater Bay, Fort Vancouver, Tacoma, Puget Sound, Seattle, Fort Steilacoon, Olympic Mountains, Port Angelus (30 miles from), Lake Washington, Washington; Comox Lake, Victoria, British Columbia (fig. 76).

Variation.—Judging from the available material, *concinnus* is identical with *parietalis* in scutellation and proportionate tail length.

The variations and averages in these characters for nearly all of the specimens examined are placed in the following table:

Locality.	Dorsals.	S. labials.		I. labials.		Ventrals.		Subcaudals.		Tail length.	
		Range.	Ave.	Range.	Ave.	Range.	Ave.	Range.	Ave.	Range.	Ave.
(*24 specimens.*) Fort Steilacoon, Seattle, Tacoma, Puget Sound, Washington........	19-17	7-8	7.1	8-10	9.8	152-170	163	63-90	76.5	0.215-0.286	0.252
(*3 specimens.*) Port Angelus, Olympic Mountains, Washington...	19-17	7-8	7.7	9-10	9.7	155-165	162	79	79	.20- .259	.238
(*7 specimens.*) Comox, Victoria, Vancouver Island.....	19-17	7-8	7.1	8-10	9.4	160-170	164	69-86	76	.219- .266	.238
(*9 specimens.*) Portland, Oregon...........	19-17	7-8	7.1	9-10	9.8	152-172	164	68-86	77.2	.208- .265	.242

The variation in color has been briefly treated in the general description. There are two color phases, however, that are quite well marked.

(1) Stripes usually present, the dorsal generally confined to the median row. Spots of first row either distinct or not differentiated. Belly blackish. This is the type of color described by Baird and Girard and since known as *pickeringi*. It is found in western Washington and to the northward.

(2) Ground color black. Lateral stripe absent. Interspaces (red) present. Dorsal stripe occupies the median and adjacent half rows. Belly blackish. This is *Tropidonotus concinnus* Hallowell. So far the only specimens that we have seen hail from Portland and Eugene City, Oregon, and it is interesting to note that out of nine specimens from this immediate region (in the U. S. National Museum) every one is of this type. Notwithstanding the fact that it has thus apparently a different range from color phase (1), I am in harmony neither with those herpetologists who consider this color phase as an individual variation of *parietalis* nor with those who would give it subspecific rank. To me it seems that its distinctive traits (width of dorsal stripe, together with a loss of the lateral) are too slight for the latter position, and that the increased amount of black pigment classes it distinctly with the melanistic form that inhabits western Washington

and the adjoining part of British Columbia; in which case the name *concinnus* Hallowell (1852) takes precedence over *pickeringi* Baird and Girard (1853).

As stated under *parietalis*, variations in color occur which are indistinguishable from some of those of that form. Thus, the black pigment on the sides may be disposed as two black bands separated by a red one, and it was upon a specimen of this kind from Puget Sound, Washington, as well as the two from Pitt River, California (p. 171), that Cope based his subspecies *tetrataenia*. Similarly, when the dorsal stripe occupies one and two half rows, as it occasionally does, the specimens are very similar to dark specimens of *parietalis* from Montana, and in fact one of the type specimens of *trilineata* was a *concinnus* from Fort Townsend, Washington.

Affinities.—*Concinnus* grades directly into *parietalis* through dark specimens of the latter (the phase *trilineata*) in the Cascade range. It has no direct relationship with *ordinoides*, as may be seen by the scutellation, for we have shown that *ordinoides*, has generally less than 19–17 scale rows, while the variations above this number in the latter indicate that it is derived from a form with a larger formula than 19–17.

SIRTALIS.[a]

Description.—This form is one of the best known in the genus, probably owing largely to the fact that it is very common in a thickly settled region. At the present time the material available for study numbers nearly as many specimens as that of all the other forms combined.

The lateral stripe is always on the second and third scale rows, and the eye is large. The dorsal stripe usually occupies the median and halves of the adjacent rows, is frequently narrower and occasionally wanting. The dorsal scale formula is practically always (in 598 out of 600 specimens examined; see p. 181) 19–17; the supralabials nearly always 7, occasionally 8, rarely 6; the infralabials 10, occasionally 9 or 11. The oculars are usually 1–3, often 1–4, more rarely 1–2; the subcaudals 54 (female) to 84 (male); the ventrals 137 (female) to 167 (male). Tail length .192 to .262.

The ground color above varies from light green, light greenish olive, or light olive brown to dark greenish olive, dark olive brown, brown, or black. The first row of scales is generally (but not always) much lighter than above, but still somewhat darker than the second and third rows. There are two rows of well-defined spots (rarely fused) on the skin between the lateral and dorsal stripes, and these usually cover more or less of the involved scales (exclusive of the

[a] *Thamnophis sirtalis* (Linnaeus), Syst. Nat., 10th ed., I, p. 222. Includes *Coluber ordinatus* Linnaeus, *Eutaenia sirtalis graminea* Cope, *E. sirtalis obscura* Cope, *E. sirtalis semifasciata* Cope, and *E. sirtalis pallidula* Allen.

keels). The spots are not usually distinct upon the scales, however, owing to the darkness of the ground color. Interspaces on the skin white or bluish white, never red except occasionally immediately along the lateral stripe. Stripes greenish or bluish, usually tinged with yellow. Ventral surface greenish or bluish slate. Ventral spots usually well defined. Sides of head greenish, yellowish, or bluish; abials partly margined with black.

Habits and habitat relations.—Even in the case of this well-known form but little has been recorded on the habitat relations. The expe-

FIG. 77.—FORESTS IN THE PORCUPINE MOUNTAINS, MICHIGAN. THAMNOPHIS SIRTALIS IS OF GENERAL DISTRIBUTION IN SUCH FORESTED REGIONS IN EASTERN UNITED STATES.

rience of the writer indicates that it is quite generally distributed in the Eastern forest region, for while it is found most commonly in the vicinity of water, it is not uncommon in the clearings, woods, and thickets on the neighboring hills (fig. 77).

The food consists principally of frogs, toads, salamanders, earthworms, and various insects. Whether or not it feeds to any great extent upon tadpoles and fish is undetermined. Garman (1892, 268) states that they eat these animals, and I have observed them to

capture fish in captivity, but since in the wild state they are not particularly aquatic, the truth of the matter is probably that they capture these forms when they encounter them in small pools, but that this is comparatively seldom. The number and kinds of insects eaten is also a questionable point. It is true that many species are found in the stomachs examined, but, as Surface (1906, 149) says, many of these are "taken inside of the toads and other batrachians which the garter-snake had eaten." However, both adults and young are very fond of earthworms. As other garter-snakes, *sirtalis* apparently does not refuse dead food. Mr. N. A. Wood, of the University of Michigan, reported to the writer, on May 18, 1907, that he saw a specimen of this species swallowing a yellow warbler, which he had observed lying dead in the same place on the preceding day. In the latter part of October, 1907, the writer discovered an individual at Portage Lake, Washtenaw County, Michigan, busily engaged in an attempt to swallow the dried remains of a large green frog (*Rana clamitans*).

The breeding habits have been commented upon several times, but are as yet only incompletely known. In southern Michigan copulation takes place in April, and at this time it is reported on good authority that these snakes often collect in groups, probably owing to the procreative impulse. I have not witnessed this nor can I find any observations on the act of copulation. The latter I have seen but once, and then but imperfectly. It took place on April 21, 1906, between two specimens in captivity. The male in this case lay at full length beside the female, and evidently attempted to excite her by gently rubbing her neck with his snout. He finally threw a fold of his tail across hers, and turning his ventral surface against her side began spasmodic contractions of the abdominal muscles, which were continued from twenty to thirty minutes. Unfortunately the snakes were then disturbed and the observations ceased. They indicate, however, that there may be some interesting courtship reactions to be observed in these snakes.

The period of parturition extends from the latter part of July to about the middle of September. Both of these dates are only approximate, as definite observations are wanting. The number of young is very variable, the average range in number being probably about 10–30, while as many as 78 have been recorded in a single brood, which is not at all an unusual number, since *parietalis* may have, according to our observations, as many as 73. After birth the young remain for a short time about the mother, but this time is probably limited to a few hours at most. In captivity there is little tendency discernable to stay near the mother, and although we have several times seen a mother and her brood in a wild state, in every case noted, when the mother became alarmed, or for some other reason moved away, the young scattered in all directions, and it is improbable that they ever

came together again. The quickness and completeness with which the little snakes disappear when alarmed may partly explain the fable that this snake swallows its young.

Ditmars (1907, 235–236) gives the following interesting account of the hibernating habits:

> The favorite situations in which to pass the cold months are in soft soil on a slope that faces the south. Here the reptiles burrow down a yard or more. Rocky situations are often selected, and among the clefts and fissures, one opening into another, the snakes are enabled to retire to a considerable depth from the surface.
>
> It is in the fall that these snakes congregate in large numbers on ground that is suitable for the winter's sleep. Here they sun themselves during the middle of the day, retiring into clefts and burrows during chilly autumn nights. As the nights become colder, their basking periods during the day are shortened, and finally, after the first severe frost, they remain below the ground for the winter. Instinct seemingly attracts them to these places of hibernation, for such spots are usually poor feeding grounds and have been devoid of snakes during the summer months. In spring, the breeding time, the reptiles remain in numbers until the weather has become well settled and the danger of needing good shelter from the cold spells has passed. Then they scatter into the ravines, the thickets, along streams and brooks, until the scene that has abounded with sinuous, crawling life is deserted.

This account harmonizes very well with the writer's observations in southern Michigan. In the latter region they are found in the autumn on sunny hillsides in the immediate neighborhood of holes, into which they hasten when alarmed, but that they dig these holes themselves yet remains to be proven, nor after the beginning of the period of hibernation do they necessarily "remain below the ground for the winter," for if periods of marked moderation in the temperature occur they will come out in December, January, or February. Thus, on January 22, 1906, which was a warm day (60° F.) in a period of very moderate temperature, a collector for the University of Michigan Museum reported seeing a large garter-snake near Grass Lake, Washtenaw County, Michigan, which was undoubtedly this species.

Range.—This form is practically confined to the eastern wooded district of North America. Thus, its range on all four sides is rather definitely bounded—on the south by the Gulf, on the east by the Atlantic, on the north by its ability to endure low temperatures, and on the west by the margin of the prairie (fig. 78).

Specimens have been examined from the following localities: Lac Aux Sables, Quebec; Auburn, Aroostook County, Androscoggin, Maine; Wellesley, Marthas Vineyard, Woods Hole, No Mans Land, Tuckermuck, Gloucester, Boston, Cohasset, Arlington, Cambridge, Massachusetts; Conanicut Island, Dutch Island, Chepachet Island, Newport, Rhode Island; Falmouth, Bartlett, New Hampshire; Monroe County, Delaware County, Philadelphia, Port Allegheny, Foxburg, Huntingdon County, Pennsylvania; Westport, Adirondack, Catskills, Syracuse, Tioga County, New York city, New York; Sussex County, New Jersey; Washington, District of Columbia; Centerville, Prince

George Island, Branchville, Maryland; Courtland, West Fork, Greenbrier River, North Fork Potomac River, South Fork of Files Creek, Elk River (Cougar's Mills), Beech Mountain, Cheatbridge, Huttonsville, Hinton, West Virginia; Page County, Fairfax County, Arlington, Suffolk, Virginia; Glasgow, Kentucky; Tyree Springs, Union County, Tennessee; Kinston, Raleigh, Jackson, North Carolina; St. Simons Island, Georgia; Enterprise, Georgiana, Kissimmee River, Eustis,

FIG. 78.—DISTRIBUTION OF THAMNOPHIS SIRTALIS, AS INDICATED BY THE LOCALITY RECORDS.

Arlington, Fort Bassenger, Clear Water, Tarpon Springs, Orlando, Florida; Eutaw, Mobile, Alabama; Kemper County, Mississippi; New Orleans, Louisiana; Fort Jessop, Hot Springs, Arkansas; Waco, Texas; St. Charles County, St. Louis, Jefferson County, Crawford County, Oregon County, Missouri; Aux Plains, West Northfield, Mount Carmel, Olney, Chicago, Paris, Rock Island, Lake County, Berwyn, Henderson County, Northfield, Illinois; Lake Maxinkuckee, Vincennes, Bascom, Sims, Indianapolis, Winona Lake, Brookville, Montgomery County,

Indiana; Oberlin, Columbus, Sandusky, Montgomery County, Yellow Creek, Ohio; Washtenaw County, Grand Rapids, Grosse Isle, Livingston County, Eaton County, Oakland County, Oceania County, Crawford County, Iosco County, Alma, Isle Royale, Porcupine Mountains, Bessemer, Houghton County, Baraga County, Marquette, Michigan; Thompson's Lake, Racine, Lauderdale, Milton, Wisconsin; Lucknow, London, Wellington County, Gravenhurst, Ontario, Canada.

It occurs on the nearest of the outlying islands in the Atlantic Ocean and Gulf of Mexico. The most northern reliable records are Isle Royale, Michigan, and Gaspé, Quebec (Cox, 1899), but it doubtless ranges somewhat beyond this latitude. On the other hand, its western limits are neither well known nor definitely ascertainable, for in this direction it intergrades with *parietalis*, the ranges of the two forms being apparently conterminous. At present its western boundary may be considered as closely approximating that of the hard-wood forest. Without doubt typical specimens will be found to occur in Minnesota and Iowa, but this can not now be settled, inasmuch as the principal character (red interspaces between the lateral spots) that distinguishes *parietalis* from *sirtalis* disappears rapidly in preserved material.

Variation.—Notwithstanding the wide range of *sirtalis*, the variation in scutellation is slight. As already stated, the dorsal scale formula is so constantly 19–17 that but two specimens out of some six hundred examined have any other. In these two specimens (one each from Fort Bassenger, No. 22696, and Georgiana, Florida, No. 14833, in the U. S. National Museum) the formula is 19–21–19–17. The labials are comparatively nearly as constant, the average formula for localities throughout the range being very close to 7/10. Occasionally specimens, regardless of their geographic position, exhibit 8 supralabials, and much more rarely 6, while contrary to this the variation in the infralabials 8, 9, or 11 apparently tend somewhat more strongly toward a lower number than 10. This is illustrated in the diagrams (figs. 79–80), which illustrate the conditions in 113 specimens from southeastern Michigan (Livingston, Washtenaw, Oakland, Eaton counties), and the variations in the material examined from every other locality is apparently very similar.

The number of ventral plates varies from 137 to 167, and the average is rather constant throughout the range. I believe, however, that there is a slight reduction in the mean number in specimens from extreme eastern United States. Thus, the diagram (fig. 81) shows that the average for specimens west of the Allegheny Mountains is very close to 154 (between 150–155), but in specimens from Maryland, Massachusetts, and Rhode Island the mean is between 145–149. Based as they are on rather extensive series, I

believe that these averages are quite representative of the actual conditions.

The tail length and number of subcaudal plates also exhibit no noticeable geographic differences. The extremes are: Subcaudals 54-74 (female), 62-84 (male); average for localities with more than fifteen specimens, 64-70; tail length, .192 to .262; average of fifty-four specimens from Washtenaw County, Michigan, .221.

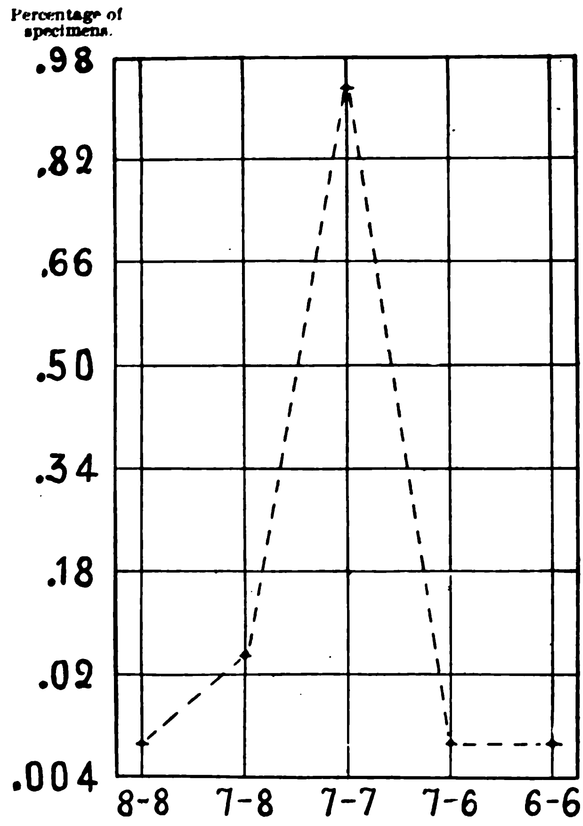


FIG. 79.—VARIATION IN THE NUMBER OF SUPRALABIALS IN 113 SPECIMENS OF THAMNOPHIS SIRTALIS FROM SOUTHEASTERN MICHIGAN.

Similarly but few of the color phases have distinct geographic limits. About six of these forms have been described.

(1) *ordinatus* Linnæus.—This color phase is characterized only by the absence of the dorsal stripe, but even so, if the character were constant, some excuse might be had for considering it distinct from *sirtalis*. As it is, however, the same brood may contain individuals both of this and the normal phase, while among adults various intermediate stages in the distinctness of the dorsal stripe occur, so

that it is frequently impossible to refer a specimen definitely to either form. Nevertheless, while its range is not distinct from that

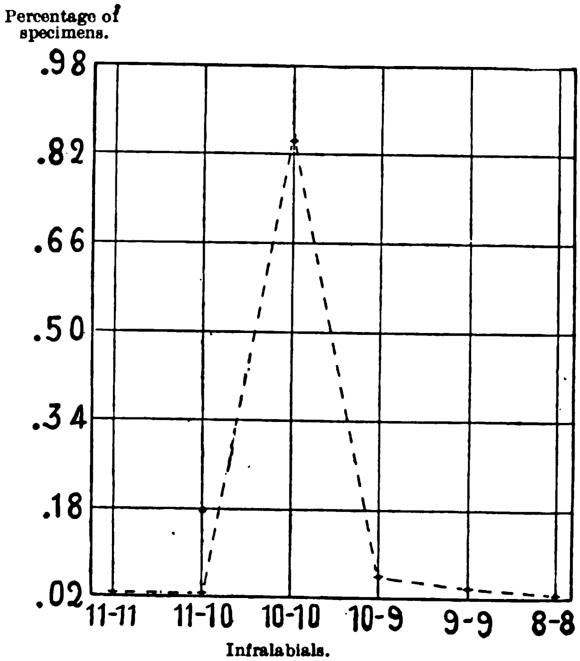


FIG. 80.—VARIATION IN THE NUMBER OF INFRALABIALS IN 113 SPECIMENS OF THAMNOPHIS SIRTALIS FROM SOUTHEASTERN MICHIGAN.

of *sirtalis*, it must be pointed out that the majority of the specimens examined hail from northeastern United States (east of Ohio and

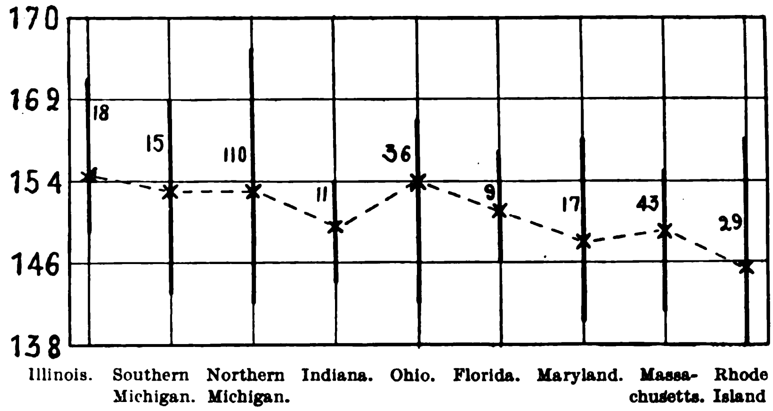


FIG. 81.—DIAGRAM SHOWING THE VARIATION IN THE NUMBER OF VENTRAL SCUTES IN THAMNOPHIS SIRTALIS.

north of North Carolina), those from outside of this region being but scattered records.

(2) *graminea* Cope.—Typical specimens of this phase may be defined as follows: Above light green usually clouded with yellow. Lateral spots not evidenced on scales, except occasionally anteriorly, but present on the skin. Interspaces on the skin bright yellow. Belly light green, often tinged with yellow. Dorsal and lateral stripes absent. This form is very similar to the *ordinatus* phase except that the ground color above is lighter, the dark spots are mostly absent from the scales, and the lateral stripe is not discernable. But, as in *ordinatus*, all intermediates are found between this color phase and that of typical *sirtalis*. In specimens in which the ground color is somewhat darker the dorsal stripe is indicated by a lighter shade on more or less of the three median dorsal rows, the lateral by a similar shade on the second and third rows.

This color phase is very striking, and to one not familiar with the variability of the form it would seem quite desirable to recognize it as a distinct form, the more so as it is apparently common in many localities. From the proportion of specimens in the collections it seems to occur principally in eastern Ohio, becoming rarer in the western part of the State, but extending into eastern Indiana.

(3) *pallidula* Allen.—But little attention has been given to this phase since its original description. It may be described as follows: Ground color above dark. Spots obscured on scales. Stripes dull greenish or bluish, the dorsal more or less obscure. This form differs from *ordinatus* only in the obscurity of the lateral spots and the darkness (often amounting to partial obscurity) of the stripes. It has been recorded from the vicinity of Intervale and Bartlett, New Hampshire, but the University of Michigan Museum expedition secured specimens on Isle Royale, Lake Superior, that are indistinguishable from the topotypes of *pallidula* in the National Museum.

(4) *semifasciata* Cope.—The character upon which this form has been distinguished is very slight and strikingly like the one upon which the form *T. eques collaris* was based. In the specimens referred to *semifasciata* the first two to five spots of the two rows between the lateral and dorsal stripes are opposite and confluent transversely, forming blotches that may or may not cross the lateral stripe. This coloration occurs very frequently in specimens in and immediately about the "prairie peninsula," in Indiana, Illinois, southern Michigan, and southern Wisconsin, and apparently much less commonly to the east and south of this region. But not all of the specimens from this region exhibit this tendency, toward the fusion of the lateral spots into transverse bands anteriorly, in the same degree. Many individuals are found which either have but one or two or even no blotches, and it is evident that the character is far from being a constant one. It is significant that the region where this color phase is best developed is close to the range of *parietalis*, which often exhibits the same

(5) *obscura.*—This so-called variety of various authors has had an interesting history. Defined by Cope as differing from *sirtalis* in the fusion of the lateral spots, it has been made by various writers to embrace slightly anomalous specimens of *sirtalis*, *parietalis*, and *butleri*. The original specimens from Westport, New York, are *sirtalis*, and they are peculiar only in that the ground color above is so dark as to obscure the spots on the scales (by no means an uncommon occurrence). The "*obscura*" specimens of Morse which are not referable to *butleri* are also of this description. Cope (1900, 1074) further describes specimens from Lac Qui Parle, Minnesota, as follows: "The fusion is complete as to the superior row of spots, but the inferior may be seen faintly outlined on stretching the skin, as in some dark forms of *E. s. parietalis*." This would seem to denote that the spots on the other specimens referred to *obscura* by Cope (those from Westport, New York) were entirely fused on the skin; but this is not true, for on stretching the skin of the latter the spots are seen to be perfectly distinct. As a matter of fact the Minnesota specimens referred to *obscura* by Cope are *parietalis* (in which the upper row of spots is normally fused), the New York specimens of this writer and the Ohio specimens (in part) of Morse being rather dark specimens of *sirtalis*.

I have already alluded to the fact (see p. 88) that both Morse and Cope have referred specimens of *butleri* to *obscura*. This was made possible by the insufficiency of the original description of the latter, which gives the impression that the spots are fused on the skin in typical specimens, which is the case to a considerable extent in *butleri*.

(6) In many specimens from Indiana, Ohio, southern Michigan, and western Pennsylvania the skin between the first and third or fourth scale rows is more or less red. On the basis of such specimens it has been asserted that *parietalis* occurs in the above named States. These specimens are typical *sirtalis* in every other character, while the red when present is always in such a small amount that the specimens need never be confused with *parietalis*.

While in my judgment it is impossible to recognize any of the above forms as distinct, I believe that the first three (*ordinatus*, *graminea*, and *pallidula*) are significant in that they represent the same tendency in the form, i. e., toward an increased darkness in color. I believe that the increasing darkness of the stripes (which leads to their obscurity) is an evidence of such a tendency. This explains the fact that the extremes in this direction (those in which the stripes are obscured and which have been described as distinct) have no distinct geographic range, but are liable to crop up in any considerable collection of specimens from almost any locality in the range of the form. Nevertheless it seems to be evident also that the tendency is much more pronounced in the north and northeastern than in south and southeastern parts of the range, although a considerably larger

number of specimens is needed from the latter region before this point can be definitely demonstrated.

Affinities.—The only apparent near relative of *sirtalis* is *parietalis*. I have already discussed this relationship. It should be pointed out, however, that the fact that typical specimens of *sirtalis*, from Indiana to western Pennsylvania, have frequently a small amount of red pigment on the sides, also points toward a relationship between these two forms. Brown's (1904, 470–471) ingenious suggestion that *sirtalis* is related to *radix* through *butleri* has little to recommend it, for from my point of view there is no evidence from the scutellation that *sirtalis* is at all nearly related to *butleri*, although the general similarity in the scutellation and the intermediate position of the lateral stripe in the latter has been occasionally seized upon as indicative of such an affinity, while there is no evidence either in the position of the lateral stripe, scutellation, or geographic distribution that it is anything but distantly related to *radix*. To establish a relationship with the forms of the *Radix* group one must entirely ignore the evidence of the lateral stripe and the geographic probabilities, as *sirtalis* entirely overlaps the range of *butleri*, and in part the range of *radix*, without showing the slightest modification in any character that would point toward any close relationship with either form.

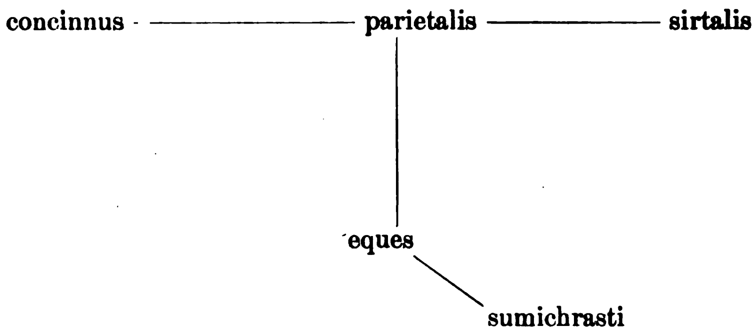


FIG. 82.—PHYLOGENETIC DEVELOPMENT OF THE SIRTALIS GROUP.

CONCLUSION.

Of the four groups into which I believe the genus *Thamnophis* is differentiated, the *Sirtalis* group is without doubt the least diversified. This is shown by the fact that most herpetologists have been willing to give to its members but subspecific rank, owing to their evident intergrading, and by the further fact that variation, geographic or otherwise, is very slight. If we grant the unity of the group as here described (fig. 82) the geographic differences may be outlined as follows:

1: The dorsal scale rows are 19–17 in most forms, the only departure from this formula being in southern Mexico, where it becomes 17–15.

2. The supralabials are normally 8 in the two forms in Mexico and 7 in the others. The infralabials are normally about 10 in all forms.

3. The ventrals, subcaudals, and tail length are, so far as known at present, practically the same throughout the entire range of the group.

Thus the geographic variations in the scutellation consist of a maximum of 19–17 dorsals and 8 supralabials in the form whose principal distribution is on the Mexican plateau (*eques*), and of a reduction in the dorsal scale formula in the forms to the southward and in the number of supralabials in those to the northward of the range of this form. It only remains to be pointed out that the area of principal reduction between the forms with a different scutellation is small.

DISCUSSION OF ORIGINS.

In the general discussion of the characters and variation in the genus, as well as in the detailed discussion of the various forms, I hold to have established two fundamental facts as follows: (1) That the genus *Thamnophis* is naturally divided into four groups of nearly equal importance, the component forms of which are directly related; (2) that each of these groups is represented by a form in the northern part of Mexico and in southwestern United States which has the maximum scutellation for the group. To what extent do these facts throw light upon the question of origins? Darwin pointed out in his Origin of Species that on the principle of descent with modification the only rational view is that the several species of a genus have been derived from a common progenitor and have undergone modification in the course of dispersal. We are then confronted with the problem of locating the center of origin of a genus before we can intelligently search for laws governing the modifications which have resulted in the component forms as we find them at the time of our study.

Various criteria have been formulated toward this end.[a] At least one of these can not be used in this instance, as it is based on peculiar conditions existing in one group of animals: it is the direction of the annual migration routes of birds (Palmén). Of the others I believe that Adams's sixth criterion is of the most general and easy application as well as logically (assuming, of course, the theory of descent and single centers of origin) the most reliable. This rule is that the different lines of dispersal in any genus radiate from, or, conversely, converge toward, the geographical center of origin. As already mentioned, I believe that this rule follows logically from the theory of descent formulated by Darwin, so that if only the lines of dispersal can be determined in any group in which there are more than one, it should be relatively easy to fix upon the center of origin of that genus. In discovering that different nearly equal groups of related

[a] See Adams (1902 *b*).

species occur in the garter-snakes, I have proof that different lines of dispersal have been followed; and it will furthermore be recalled that, as I have defined these groups, they are each composed of forms which are distributed linearly. When I find, then, that nowhere else in the range are all of the groups represented, I am justified in concluding that the genus has had its origin in a general way in northern Mexico.

As a corollary to this criterion is Adams's first test, namely, that the center of origin is the location of the greatest differentiation of a type. If the lines of dispersal converge toward or radiate from the center, in this general region and here only, it should be possible to find representatives of each group or lines of directly related forms. This is exactly what occurs in the genus *Thamnophis*. In no region except Mexico can there be found representatives of all of the four groups of garter-snakes, while at least to the northward representatives of but one or two groups are found toward the outlying parts of the range.

The application of either of the above tests, however, can not, in my opinion, be trusted to indicate more than the general region in which the center of origin of the garter-snakes is located, for in a constricted area like Mexico and Central America the groups differentiated in one part must of necessity remain together *geographically* until they emerge into a more extensive land area, such as North and South America. This is exactly what occurs, for the four groups occur throughout Mexico, although, as will be shown later, they probably became differentiated in a particular part of this general region.

Another test that has been suggested is the one laid down by Allen that synthetic forms will be found at the center of origin. It is one that naturally follows an acceptance of the theory of single centers of origin, and is closely bound up with the first two criteria cited—the convergence of lines of dispersal and the location of the greatest differentiation of a type. At the center of origin of the genus of garter-snakes, then, theoretically all four groups should be represented, and the representatives of these groups should be more closely related than any other representatives of the groups. This point is difficult to test, owing to the fact that the different groups as they diverge genetically and often geographically may converge in appearance. This reduplication of forms in widely separated areas occurs to such an extent in the garter-snakes as to make it often difficult or even impossible to determine specimens without a knowledge of the locality in which they were taken. This parallelism is brought about by the reduction in size which takes place as the groups depart from the center, as this reduction in size is accompanied by a reduction in scutellation. Thus every group has forms which are practically identical in the number of scales in each series.

This is best shown in the *end forms*. Thus in *butleri* (Indiana, Ohio, etc.), *ordinoides* (coast of Washington, Oregon, and northern California), *scalaris* (Veracruz), and *sumichrasti* (Veracruz) the scutellation is often identical, while the coloration in but one of these, *scalaris*, can be relied upon as a differential character. As stated above, the similarity of such forms often makes it difficult to distinguish between parallel and synthetic types, but an exact knowledge of the value of differential characters and of geographic distribution and trends of variation will allow the distinction to be made. While it is thus impossible to accept similarity in scutellation between the forms of different groups as always indicative of nearness of relationship, it is significant that where the groups come together geographically their representatives also come to resemble each other closely in scutellation. Thus, in *megalops*, *angustirostris*, *eques*, and *proximus* the labials are practically the same in number, and the number of ventral scutes is as nearly the same as can be expected for so variable a series. It is true that the usual dorsal scale formula in *megalops* and *angustirostris* is 21–19–17, while for *proximus* and *eques* it is 19–17, but it must be remembered that it is nowhere higher than 19–17 in the respective groups to which *eques* and *proximus* belong, so that these forms resemble *megalops* and *angustirostris* more closely than the two latter are resembled by any other forms of the *Sauritus* and *Sirtalis* groups. While, therefore, similarity in scutellation does not necessarily in itself (especially at the limits of the range of the groups) imply close relationship, if we grant the evidence of the other criteria that the center of dispersal is in Mexico, there is no objection from this standpoint, for *angustirostris*, *megalops*, *eques*, and *proximus* give every indication of being more closely related to each other than any other four forms in the different groups. If this is true it restricts the center of origin of the genus to northern Mexico.

Two other criteria of Adams may be considered together, i. e., "continuity and direction of individual variation or modification radiating from the center of origin along the highways of dispersal" and "direction indicated by biogeographical affinities." Evidently, it seems to us, both of these criteria are of importance in any investigation of this kind, for, while they are not concerned primarily with the conditions at the center, they are supreme tests of the genuineness of the lines of dispersal, which must be determined before the center can be located. The tests can be reformulated as follows: Are the variations in the forms along any supposed lines of dispersal continuous, and is it probable geographically that the forms are related in the supposed manner? For instance, I might divide the garter-snake into several groups on the basis of similarity in the number of scale rows, but if I then applied these tests we would find that

not only would the forms of each group fail to intergrade with each other in their variations, but that it would be extremely improbable, in view of their geographic location, that they were at all closely related. As it is, *each group is formed of a line of directly related forms, the extremes of which are very distinct, but those which are geographically nearest together are but slightly different from each other.*

As previously stated, I believe the tests used above are valid, and when applied show the utter untenableness of the hypothesis put forward by Cope and Brown that the center of dispersal is in southeastern United States and that *sirtalis* is the ancestral form. From the latter standpoint the groups which we have distinguished in the genus must be ignored and the forms connected in a manner entirely antagonistic to the criterion that the lines of dispersal shall be indicated by continuity in variation and be in harmony with geographic probabilities. Note in the diagram of affinities given by Brown (1904, 471) that the lines of genetically related forms fullfil the requirements of neither of the above tests, and that, admitting the validity of our own groups, we can get, at most, but three lines radiating from eastern North America, and one of these does not reach the southeastern States! If the criteria discussed above are valid I believe that they indicate unquestionably that the center of origin is in northern Mexico, and I may test the other criteria that have been formulated by different writers.

Two other criteria of Adams may be considered together. They are: That the center of origin will be marked by a "dominance or great abundance of individuals" and by a minimum "dependence upon a restricted habitat." Neither of these postulates is true in this genus, for, although much yet remains to be discovered on the habitat relations and abundance of the different forms, garter-snakes are not noticeably abundant but rather rare in the desert and coastal regions of northern Mexico and southern New Mexico and Arizona, while in many places in North America they are almost increditably numerous.[a] Again, on the plateau of Mexico and in southern New Mexico and Arizona, which forms the home of three of the groups, the conditions are very arid, and these snakes are evidently confined principally to the immediate vicinity of mountain streams and similar environments where water is most abundant. On the other hand, in the forested regions of North America, notably in eastern United States, the forms, although showing habitat preferences, are of quite general distribution. This is exactly what one might expect in view of the preference shown by these snakes for a moist habitat. It has been objected that this habitat preference argues against the conclusion that the genus originated in northern Mexico. I can not see the force of this argument, for it seems to me that partially aquatic

---

[a] ...urgh (1897, 212) and Ruthven, p. 73, in this paper

forms may originate in favorable environments in arid regions, just as strictly aquatic forms may do so. I believe, therefore, that, in cases of this kind at least, these two criteria (abundance and least restriction to a particular habitat) are not valid, for a group may originate in a region where the environmental conditions to which it is adapted are more restricted than elsewhere.

The fifth criterion of Adams, "Location of greatest productiveness and its greatest stability" (Hyde, 1898, p. 575), is in the main inapplicable in this study, owing to our almost total ignorance of the breeding habits of the various forms. It seems worth recording, however, that the most dwarfed forms (those with the smallest scutellation) have apparently a fewer number of young in a brood than do the larger forms, as might be expected. For example, *butleri* generally has about a dozen young in a brood, while *radix* may have forty or fifty. As the relative productiveness thus seems to be correlated with size in this genus, the location of the area of greatest productiveness would be near the center of origin, but even if this should be found to be the case it would prove only that the test can be used in genera in which the forms are the result of dwarfing. However, as said above, so little is known of the breeding habits of these snakes, that it is hazardous to attempt any general conclusions at this time.

Another criterion that is quite easy to apply is the one formulated by Allen in 1877 (1877, 378): "The representatives of a given species increase in size toward its hypothetical center of distribution, which is in most cases doubtless also its original center of dispersal." In snakes it is doubtful if we have any such a thing as "adult size" in the sense employed in birds and mammals, so that, without some method of indicating dwarfing, this criterion is valueless. Fortunately we believe that differences in the number of scales in the dorsal, labial, and ventral series is, as outlined in the chapter on variation, an index to the relative size in these snakes, and, if so, we have in these characters a ready means of determining the relative dwarfing of the different forms, even if young specimens alone are available for study.

Applying this criterion to the conditions outlined in the description of the different forms the results are startling, for *in every group the maximum scutellation is found in the form which inhabits northern Mexico, while from this region the scutellation decreases progressively in the different forms, so that the minimum is only found in the forms which constitute the extreme ends of the series, and are thus genetically and geographically most distant from the form with the maximum number (at the center)*. In other words, *the forms of the same group are progressively more dwarfed away from northern Mexico.* [This does not include those forms of the *Sirtalis* group (***concinnus*** and ***sirtalis***), which are

based only on color characters.] The results are exactly those which we should expect if the criterion is a valid one, and the center of origin is in the northern Mexico, as indicated by the convergence of the lines of dispersal, but it must be recognized that while these facts may be in harmony with the theory, they can not be considered as proving it until the cause of dwarfing is known.

METHOD OF EVOLUTION OF THE FORMS.

It is not the purpose of this paper to discuss the causes of evolution in the garter-snakes, for the study of distribution and variation alone can not encroach upon the field of experimental morphology in determining the causes and effects of the processes which effect the animal form. It is the province of such studies, however, not only to point out probable origins and relationships, but also to search for the methods of evolution, so that the experimentor may work intelligently in his search for the processes which cause the production of one species from another.

If the range of the forms in the different groups of garter-snakes be carefully examined it will be found (1) that the different forms of the same group are found in different geographical regions, characterized by different environmental conditions; (2) that the area along the common boundary of two forms of the same group, where transition in characters takes place, is relative narrow.

These conditions are exactly in harmony with Stone's (1903, 659) statement for terrestrial vertebrates that "we never find two geographic races or subspecies of the same form occurring together, except during times of migration," and Jordan's (1905, 547) statement that "given any species in any region, the nearest related species is not likely to be found in the same region nor in a remote region, but in a neighboring district separated from the first by a barrier of some sort." Steere (1894, 419) evidently had the the same point in mind when he formulated the law "the genus is represented by only a single species in one place," but he expressed it too generally, for as a matter of fact, as shown in this genus, two or more species may occur together in the same environment, but the *direct relative* of any species is to be found not in the same but in a neighboring environment. In the light of the results of this investigation, as well as the known instances in which different species occur in the same geographic area but in different environments, it seems expedient to reformulate the law to read as follows: *Directly related forms on any line of descent generally occupy neighboring environments.* Although expressed in different terms, this is exactly the same conclusion arrived at by Ortmann (1906, 512) in his study of the crawfishes of Pennsylvania.

At the present time it seems to be becoming recognized that the abov[illegible] of wide application among the higher orders of verte-

brates. However, any attempt to determine from geographic and variation data that internal factors, the direct influence of environmental conditions, or in fact any other cause is responsible for this close correlation of particular forms with particular environments must fail to be conclusive, for experimental work alone can definitely reveal the influence of the environment upon the dwarfing and scutellation in these snakes. In the case of the garter-snakes, however, it should be noted:

1. That most of the forms are the result of dwarfing.
2. That the amount of dwarfing does not seem to be directly associated with the nature of the environment, for the form inhabiting a particular region is only slightly different from its nearest neighbor in the same group, while forms of widely different scutellation may inhabit the same region. Thus the conditions which apparently determine the scutellation of any form is the scutellation of its immediate progenitor, and the dwarfing which it has itself undergone.

While therefore—although it is without the province of the present work to seek to determine just what factors in the environment make it unfavorable for these snakes—I believe that I am justified in concluding that the dwarfing is associated in some way with the environment; it is as if the different environmental complexes encountered by the groups as they radiated from the center of dispersal were generally unfavorable, and the most tenable hypothesis is that the changed conditions of environment acted as a stimulus (unfavorable to growth) upon these snakes (Tower, 1906, 294–296). If this is true, isolation while attending the production of the forms in each group has had no other apparent effect than that of keeping them distinct as they were formed.

Allen (1876, 310) concludes from such evidence that the environmental conditions at the center are the most favorable for the existence of any group, and Adams (1904, 210) that the center of dispersal corresponds to a center of optimum vital conditions. It follows from Adams' standpoint that as a form enters other regions in which there are any changes in the optimum conditions these changes may be considered as unfavorable, whether they are in the way of an increase or decrease, since the zero point of a stimulus corresponds to the vital optimum and is situated between the minimum and maximum, both of which result in death. However this may be, the following facts will stand: (1) That the maximum scutellation and size in the genus *Thamnophis* occurs at the center of dispersal, and the forms that have been produced in the history of its migration have been formed principally by dwarfing and by a reduction in scutellation; (2) that the variation in the number of scales in the different series is definite and not promiscuous, and is correlated in a remarkable degree with changes in the environment.

The development of the different groups has thus been orthogenetic. This is nowhere better shown than in such forms as *radix*, where, as one passes from the western to the eastern parts of the range, not only the average but also the maximum and minimum numbers of plates in the different series decrease steadily, until the range of *butleri* is reached; and that this is in some way associated with the environment is shown in the numerous instances in which the transition from the scutellation of one form to that of another takes place rapidly, and along the boundary of different sets of environmental conditions. Even in the latter instances the variations are evidently orthogenetic, as shown by the fact that geographically there are marked differences in the maximum, minimum, and average number of scales in the different series. I have failed to find the slightest evidence that forms have been produced by mutations in this genus.

From these facts, then, it seems to me that the most tenable hypothesis of the evolution of the genus *Thamnophis* is that it originated and became differentiated into four main groups in northern Mexico. From this region the groups radiated in all directions, but principally to the northward, and wherever they entered different regions the changed environmental conditions acted as an unfavorable stimulus, which retarded growth, and differentiated the groups into dwarfed forms. If this explanation is the true one, the influence of the environment without doubt affects the young snake before birth, since the scutellation, at least as regards the number of scales in the dorsal, labial, ventral, and subcaudal series, is determined before the young are born.

THE GARTER-SNAKES AS MATERIAL FOR EXPERIMENTAL INVESTIGATION.

So far as I know, snakes have rarely been used for experimental purposes. They are unfitted for this both by the fact that apparently but one brood is raised each year and that they are difficult to keep in captivity. The garter-snakes, however, are free from both of these objections, since they are hardy in captivity, and while raising but one brood a year are very prolific. For these reasons they should present very good material for the investigator, the more so as they may be had in numbers almost anywhere in the United States. It should be borne in mind, however, that when in captivity they must be kept, as nearly as possible, in natural conditions.

Undoubtedly the problems that should first be attacked are the inheritability of the scale characters and the influence of different factors (inbreeding, unfavorable conditions of food and temperature) in producing dwarfing. The latter problem may be attacked in two ways: An attempt may be made to cause an increase in size and scutellation in dwarfed forms, such as *butleri* and *ordinoides*, or to

produce dwarfing in the larger forms, such as *radix*, *elegans*, and *megalops*. In selecting material for such work, however, the apparently more variable forms of the *Radix* and *Elegans* groups should be chosen in preference to the less variable ones of the *Sirtalis* or *Sauritus* groups. Properly handled, these snakes should furnish the best material not only for the investigation of the problems peculiar to the order, but also for the study of general problems of heredity and evolution.

BIBLIOGRAPHY.

1890. ABBOTT, C. C. A Naturalist's Rambles about Home. New York.

1902*a*. ADAMS, C. C. Postglacial Origin and Migration of the Life of Northeastern United States. Jour. Geog., I, pp. 303–310; pp. 352–357.

1902*b*. ———, ———. Southeastern United States as a Center of Geographical Distribution of Flora and Fauna. . Biol. Bull., III, pp. 115–131.

1904. ———, ———. On the Analogy between the Departure from Optimum Vital Conditions and Departures from Geographic Life Centers. Sci., N. S., XIX, pp. 210–211.

1876. ALLEN, J. A. Geographical Variation among North American Mammals, especially in Respect to Size. Bull. Geol. and Geog. Surv. Terr., II, No. 4, pp. 309–344.

1877. ———, ———. The Influence of Physical Conditions in the Genesis of Species. Radical Review, I, pp. 108–140. Reprinted Rept. Smith. Inst., 1905, pp. 375–402.

1899. ALLEN, G. M. Notes on the Reptiles and Amphibians of Intervale, New Hampshire. Proc. Bost. Soc. Nat. Hist., XXIX, pp. 63–75.

1901. ATKINSON, D. A. The Reptiles of Allegheny County, Pennsylvania. Annals Carnegie Museum, I, pp. 145–157.

1905. BAILEY, VERNON. Biological Survey of Texas. North Amer. Fauna, No. 25.

1853. BAIRD, S. F. and GIRARD, CHARLES. Catalogue of North American Reptiles, Pt. I.

1895. BAKER, F. C. A Naturalist in Mexico. Chicago.

1893. BOULENGER, G. A. Catalogue of the Snakes in the British Museum, I. London.

1896. ———, ———. Catalogue of the Snakes in the British Museum, III. London.

1904. BRANSON, E. B. Snakes of Kansas. The Kansas Univ. Sci. Bull., XIII, pp. 353–430.

1901. BRAY, W. L. The Ecological Relations of the Vegetation of Western Texas. Bot. Gaz., XXXII, pp. 99–123; pp. 195–217; pp. 262–291.

1904. ———, ———. Forest Resources of Texas. U. S. Dept. Agric. Bur. Forestry Bull. No. 47.

1882. BROUS, H. Amer. Natur., XVI, pp. 564–567.

1889. BROWN, A. E. Description of a New Species of Eutaenia. Proc. Acad. Nat. Sci. Phila., 1889, pp. 421–422.

1901. ———, ———. A Review of the Genera and Species of American Snakes, North of Mexico. Proc. Acad. Nat. Sci. Phila., 1901, pp. 10–110.

1903. ———, ———. The Variation of Eutaenia in the Pacific Subregion. Proc. Acad. Nat. Sci. Phila., 1903, pp. 286–297.

1904. ———, ———. Post-Glacial Nearctic Centres of Dispersal for Reptiles. Proc. Acad. Nat. Sci. Phila., 1904, pp. 464–474.

1903. Clark, H. L. The Short-Mouthed Snake (*Eutainia brachystoma* Cope) in Southern Michigan. Proc. Biol. Soc. Wash., XVI, pp. 83–87.

1860. Cooper, J. G. Report upon the Reptiles Collected on the Survey. Rept. Pac. R. R. Surv., XII, Book II, pp. 292–306.

1862. Cope, E. D. Contributions to the Ophiology of Lower California, Mexico, and Central America. Proc. Acad. Nat. Sci. Phila., 1861, pp. 292–306.

1866. ———, ———. On the Reptilia and Batrachia of the Sonoran Province of the Nearctic Region. Proc. Acad. Nat. Sci. Phila., 1866, pp. 300–314.

1880. ———, ———. On the Zoological Position of Texas. Bull. U. S. Nat. Mus., XVII.

1883*a*. ———, ———. Notes on the Geographical Distribution of Batrachia and Reptilia in Western North America. Proc. Acad. Nat. Sci. Phila., 1883, pp. 10–35.

1883*b*. ———, ———. A New Snake from New Mexico. Amer. Nat., 1883, pp. 1300–1301.

1885*a*. ———, ———. A Contribution to the Herpetology of Mexico. Proc. Amer. Phil. Soc., XXII, pp. 379–390.

1885*b*. ———, ———. Twelfth Contribution to the Herpetology of Tropical America. Proc. Amer. Phil. Soc., XXII, pp. 167–194.

1886. ———, ———. Thirteenth Contribution to the Herpetology of Tropical America. Proc. Amer. Phil. Soc., 1885, pp. 271–287.

1888. ———, ———. On the Eutæniæ of Southeastern Indiana. Proc. U. S. Nat. Mus., XI, pp. 399–461.

1892. ———, ———. A Critical Review of the Characters and Variations of the Snakes of North America. Proc. U. S. Nat. Mus., XIV, pp. 589–694.

1900. ———, ———. The Crocodilians, Lizards, and Snakes of North America. Rept. U. S. Nat. Mus., 1898, pp. 153–1270.

1875. Coues, E. Synopsis of the Reptiles and Batrachians of Arizona. Wheeler's Surv. West of 100th Meridian, V, pp. 585–633.

1878. Coues, E. and Yarrow, H. C. Notes on the Herpetology of Dakota and Montana. Bull. U. S. Geol. Surv. Terr., IV, pp. 259–291.

1899. Cox, Philip. Freshwater Fishes and Batrachia of the Peninsula of Gaspé, P. Q., and their Distribution in the Maritime Provinces of Canada. Trans. Roy. Soc. Can., (2) V, Art. IV, pp. 141–154.

1883. Davis, N. S., Jr., and Rice, F. L. List of Batrachia and Reptilia of Illinois. Trans. Chicago Acad. Sci., II, pp. 25–32.

1907. Ditmars, R. L. The Reptile Book. New York.

1901. Eckel, E. The Snakes of New York: An Annotated Check List. Amer. Natur., XXXV, pp. 151–155.

1880. Ellicott, E. L. American Naturalist, XIV, p. 206.

1843. Fitzinger, L. I. Systema Reptilium. Vienna.

1883. Garman, S. The Reptiles and Batrachians of North America. Mem. Mus. Comp. Zool., VIII, No. 3.

1892. ———, H. A Synopsis of the Reptiles and Amphibians of Illinois. Bull. Ill. State Lab. Nat. Hist., III, pp. 215–388.

1894. Günther, A. C. L. G. Reptilia and Batrachia. Biologia Centrali-Americana.

1907. Grinnell, J. and Grinnell, H. W. Reptiles of Los Angeles County, California. Throop Inst. Bull., XXXV.

1852. Hallowell, Edward. Descriptions of New Species of Reptiles from Oregon. ·c. Acad. Nat. Sci. Phila., 1852, pp. 182–183.

1881. Hay, O. P. Eutænia radix in Indiana. American Naturalist, XV, p. 738.

1887. ———, ———. A Preliminary Catalogue of the Amphibia and Reptilia of the State of Indiana. Jour. Cinn. Soc. Nat. Hist., X, pp. 59–69.

1892a. ———, ———. On the Breeding Habits, Eggs, and Young of Certain Snakes. Proc. U. S. Nat. Mus., XV, pp. 385–397.

1892b. ———, ———. The Batrachians and Reptiles of the State of Indiana. 17th Ann. Rept. Indiana Dept. Geol. and Nat. Resources, pp. 409–602.

1900. Heilprin, A., in Mill, H. R. The International Geography, pp. 774–781. New York.

1900. Hill, R. T. Physical Geography of the Texas Region. Topographic Atlas, U. S. Geol. Surv.

1898. Hyde, John. Variations in the Rate of Agricultural Production and One of its Causes. Science, N. S., VIII, pp. 575–576.

1896. Jackson, R. T. and Jagger, T. A. Studies of *Melonites multiporus*. Bull. Geol. Soc. Amer., VII, pp. 135–170.

1905. Jordan, D. S. The Origin of Species through Isolation. Science, N. S., XXII, pp. 545–562.

1860. Kennicott, Robert. Descriptions of New Species of North American Serpents in the Museum of the Smithsonian Institution, Washington. Proc. Acad. Nat. Sci. Phila., 1860, pp. 328–338.

1758. Linné, Carl von. Systema Natura, 10th edition. Upsalia, Sweden.

1766. ———, ———. Systema Natura, 12th edition. Upsalia, Sweden.

1894. Loennberg, Einar. Notes on the Reptiles and Batrachians Collected in Florida in 1892 and 1893. Proc. U. S. Nat. Mus., XVII, pp. 317–339.

1899. Meek, S. E. Notes on a Collection of Cold-blooded Vertebrates from the Olympic Mountains. Field Mus. Nat. Hist., Zool. Ser., I, pp. 225–236.

1896. Meldola, R. The Speculative Method in Entomology. Ann. Meet. Entomol. Soc. Lond., Jan. 15, 1896.

1891. Merriam, C. Hart. Results of a Biological Reconnoissance of South-central Idaho. North Amer. Fauna, No. 5.

1904. Morse, Max. Batrachians and Reptiles of Ohio. Proc. Ohio State Acad. Sci., IV, pp. 91–144.

1906. Ortmann, A. E. The Crawfishes of the State of Pennsylvania. Memoirs Carnegie Museum, II, pp. 343–524.

1900. Pound, R. and Clements, F. E. The Phytogeography of Nebraska. Lincoln, Nebraska.

1895. Reddick, G. Snakes of Turkey Lake. Proc. Ind. Acad. Sci., 1895, pp. 261–262.

1904. Ruthven, A. G. Butler's Garter Snake. Biol. Bull., VII, pp. 289–299.

1906. ———, ———. The Cold-blooded Vertebrates of the Porcupine Mountains and Isle Royale, Michigan. Rept. Geol. Surv. Mich., 1905, pp. 107–112.

1906a. Ruthven, A. G., in Cole, L. J. and Barbour, T. Reptilia, Amphibia, and Pisces. (Vertebrata from Yucatan.) Bull. Mus. Comp. Zool., L, pp. 146–159.

1907. ———, ———. A Collection of Reptiles and Amphibians from Southern New Mexico and Arizona. Bull. Amer. Mus. Nat. Hist., XXIII, pp. 483–604.

1882. Schneck, J. A Prolific Garter Snake. Amer. Natur., XVI, p. 1008.

1882. Smith, W. H. Report on the Reptiles and Amphibians of Ohio. Geol. Surv. Ohio, IV, pp. 633–734.

1894. Steere, J. B. On the Distribution of Genera and Species of Nonmigratory Land-Birds in the Philippines. Ibis, 6th Ser., VI, pp. 411–420.

1894. Stejneger, Leonhard. Notes on Butler's Garter-Snake. Proc. U. S. Nat. Mus., XVII, pp. 593–594.

1903. Stone, Witmer. Racial Variation in Plants and Animals, with Special Reference to the Violets of Philadelphia and Vicinity. Proc. Acad. Nat. Sci. Phila., 1903, pp. 656–699.

1906. ———, ———. Notes on Reptiles and Batrachians of Pennsylvania, New Jersey, and Delaware. Amer. Natur., XL, pp. 159–170.

1906. Surface, H. A. The Serpents of Pennsylvania. Bull. Div. Zool., Penn. State Dept. Agri., IV, Nos. 4 and 5.

1892. Taylor, W. E. The Ophidia of Nebraska. Ann. Rept. Neb. State Board Agri., 1891, pp. 310–357.

1906. Tower, W. L. An Investigation of Evolution in Chrysomelid Beetles of the Genus Leptinotarsa. Carnegie Inst., Washington, Pub. No. 48.

1905. Transeau, E. N. Forest Centers of Eastern America. Amer. Natur., XXXIX, pp. 875–889.

1896. Tutt, J. W. Philosophical Aspects of Entomology. Proc. City of Lond. Entomol. and Nat. Hist. Soc., Dec., 1896.

1897. Van Denburgh, John. The Reptiles of the Pacific Coast and Great Basin. Occ. Papers Calif. Acad. Sci. V.

1875. Yarrow, H. C. Report upon the Collections of Batrachians and Reptiles. Wheeler's Surv. West of 100th Merid., V, pp. 509–584.

1883. ———, ———. Descriptions of New Species of Reptiles in the United States National Museum. Proc. U. S. Nat. Mus., VI, pp. 152–154.

INDEX.

[The black-faced numbers indicate specific headings.]

O

SMITHSONIAN INSTITUTION
UNITED STATES NATIONAL MUSEUM
Bulletin 62

CATALOGUE OF THE TYPE-SPECIMENS OF MAMMALS IN THE UNITED STATES NATIONAL MUSEUM, INCLUDING THE BIOLOGICAL SURVEY COLLECTION

BY

MARCUS WARD LYON, JR.
Assistant Curator, Division of Mammals, U. S. National Museum

AND

WILFRED HUDSON OSGOOD
Assistant, Bureau of Biological Survey, U. S. Department of Agriculture

WASHINGTON
GOVERNMENT PRINTING OFFICE
1909

ADVERTISEMENT.

The scientific publications of the National Museum consist of two series—the *Bulletin* and the *Proceedings*.

The *Bulletin*, publication of which was begun in 1875, is a series of more or less extensive works intended to illustrate the collections of the U. S. National Museum and, with the exception noted below, is issued separately. These bulletins are monographic in scope and are devoted principally to the discussion of large zoological and botanical groups, faunas and floras, bibliographies of eminent naturalists, reports of expeditions, etc. They are usually of octavo size, although a quarto form, known as the Special Bulletin, has been adopted in a few instances in which a larger page was deemed indispensable.

This work forms No. 62 of the Bulletin series.

Since 1902 the volumes of the series known as "Contributions from the National Herbarium," and containing papers relating to the botanical collections of the Museum, have been published as bulletins.

The *Proceedings*, the first volume of which was issued in 1878, are intended as a medium of publication of brief original papers based on the collections of the National Museum, and setting forth newly acquired facts in biology, anthropology, and geology derived therefrom, or containing descriptions of new forms and revisions of limited groups. A volume is issued annually, or oftener, for distribution to libraries and scientific establishments, and in view of the importance of the more prompt dissemination of new facts a limited edition of each paper is printed in pamphlet form in advance.

RICHARD RATHBUN,
Assistant Secretary, Smithsonian Institution,
In Charge of the United States National Museum.

WASHINGTON, U. S. A., *January 15, 1909.*

PREFACE.

This bulletin is the first of a series of catalogues of type-specimens of recent animals which the U. S. National Museum intends to publish as rapidly as circumstances will permit. The desirability of formally designating a particular specimen to represent a species or subspecies is an idea of comparatively recent origin; and although it has gained general acceptance among zoologists, there are still some who doubt its importance. Though there are perhaps some valid arguments against the practice on theoretical grounds, there can be no doubt that it puts an end to uncertainties with which earlier systematists were often confronted.

The practice was not in vogue generally when the National Museum was established, and many specimens which according to present views ought to have been specially treasured were not cared for more than others, while the methods of preparing skins of mammals were at the same time very crude. It has resulted from these circumstances that the type-specimens of species described many years ago are not in as good condition as they should be. Considering the earlier point of view, however, and the vicissitudes through which the collections have passed in the course of a half century, it is fortunate, I think, that the type-specimens have not fared worse. The type-specimens of the more recently described species of mammals, both in the regular series and in the collection of the Biological Survey, are with few exceptions perfect or nearly so and very accurately and thoroughly labeled.

The National Museum has in recent years fostered the depositing of type-specimens of species of animals of all classes, and in this has had the hearty cooperation of numerous American zoologists who consider it a matter of importance to have these standards, as they may be called, permanently preserved in the national collection.

FREDERICK W. TRUE,
Head Curator Department of Biology.

INTRODUCTION.

This catalogue includes all type-specimens of mammals known to be in the U. S. National Museum on July 1, 1908. It embraces, besides the general collection in the Division of Mammals, the large collection of American mammals made by the Bureau of Biological Survey of the U. S. Department of Agriculture. The latter collection is kept in a special hall of the Museum and is under the direct charge of the chief of the Biological Survey. In the preparation of this catalogue, one author has represented the Division of Mammals and the other the Biological Survey, and, though each is responsible only for the facts concerning the types in the collection with which he is officially connected, the entire manuscript and proof have passed through the hands of both authors. The joint authorship has had correspondingly the joint direction of Dr. F. W. True, head curator of biology and curator of mammals, U. S. National Museum, and Dr. C. Hart Merriam, chief of the Bureau of Biological Survey, U. S. Department of Agriculture. Dr. True has in addition contributed all the facts concerning the types of cetaceans and has read the entire proof. It should be said also that this catalogue was begun in the Division of Mammals eight years ago, under the direction of Mr. Gerrit S. Miller, jr., assistant curator of mammals.

The list includes types (or holotypes) and cotypes, and lectotypes and chirotypes, as defined by Thomas (Proc. Zool. Soc. London, 1893, pp. 241–242) and Schuchert (Bull. U. S. Nat. Mus., 53, Pt. 1, pp. 7–18). Appended to the main list of the types now in the Museum is a smaller one, comprising those which, according to the records, should be in the national collection, but which have been lost or destroyed by various accidents.

The name of the species, or subspecies, is given as it occurs in the original description, followed by a reference to the place and date of its publication. This is followed, when necessary owing to changes made by subsequent authors, by the name now currently used for the species or subspecies. The current name is preceded by the sign of equality (=) and followed by a citation of the authority for its use, if such has been found.

The citations are followed by: (1) Museum catalogue number. (2) Nature of specimen, whether skin and skull, or skull only, or skin only,

ERRATA.

Page 35, line 25, for *orizibæ* read *orizabæ*.

Page 48, line 13 from bottom, for *panamintimus* read *panamintinus*.

Page 144, after line 18, insert = *Lophuromys aquilus* (True). See Thomas, Proc. Zool. Soc. London, 1896, p. 795.

Page 156, after line 22, insert genus *Lophuromys* and entire account of ***Mus aquilus*** True, p. 144.

Page 231, line 13 from bottom, for *horrœus* read *horrizeus*.

Page 234, line 4 from bottom, for *Neürothrichus* read *Neürotrichus*.

CATALOGUE OF THE TYPE-SPECIMENS OF MAMMALS IN THE UNITED STATES NATIONAL MUSEUM, INCLUDING THE BIOLOGICAL SURVEY COLLECTION.

Order MARSUPIALIA.

Family DIDELPHYIDÆ.

Genus DIDELPHIS.

Didelphis yucatanensis cozumelæ Merriam. Biological Survey coll.

Proc. Biol. Soc. Wash., XIV, pp. 101–102, July 19, 1901.

108498. Skin and skull. Adult male. Cozumel Island, Yucatan, Mexico. April 16, 1901. Collected by E. W. Nelson and E. A. Goldman. Original number 14700.

Well-made skin in good condition; skull perfect, except for absence of three right lower premolars.

Didelphis richmondi Allen. Biological Survey collection.

Bull. Amer. Mus. Nat. Hist., XIV, pp. 175–176, pl. 24, fig. 3, June 15, 1901.

$\frac{33136}{46140}$. Skin and skull. Adult female. Greytown, Nicaragua. February 10, 1892 (not February 7, as in original description). Collected by Dr. C. W. Richmond. Original number 16.

Well-made skin in good condition; skull perfect, except for absence of one right upper premolar, two left lower premolars, and two lower incisors.

Didelphis marsupialis tabascensis Allen. Biological Survey coll.

Bull. Amer. Mus. Nat. Hist., XIV, pp. 173–174, pl. 23, figs. 1–2, 6; pl. 24, fig. 2, June 15, 1901.

=**Didelphis mes-americana tabascensis** (Allen). See Allen, *op. cit.*, XVI, p. 257, August 18, 1902.

100512. Skin and skull. Adult male. Teapa, Tabasco, Mexico. April 7, 1900. Collected by E. W. Nelson and E. A. Goldman. Original number 14118.

Well-made skin in good condition; skull perfect, except for absence of two left upper and one left lower premolars, and four upper incisors.

Didelphis marsupialis texensis Allen. Biological Survey collection.

Bull. Amer. Mus. Nat. Hist., XIV, pp. 172–173, June 15, 1901.

=**Didelphis mes-americana texensis** (Allen). See Allen, *op. cit.*, XVI, p. 256, August 18, 1902.

$\frac{33133}{45137}$. Skin and skull. Adult male. Brownsville, Texas. April 13, 1892. Collected by F. B. Armstrong. Original number 12.

Well-made skin in good condition; skull perfect, except for absence of occipital condyles.

Didelphis yucatanensis Allen. Biological Survey collection.

Bull. Amer. Mus. Nat. Hist., XIV, pp. 178–179, June 15, 1901.

108299 (not 100299, as in original description). Skin and skull. Adult male. Chichenitza, Yucatan, Mexico. February 1, 1901 (not January 29, 1901, as in original description). Collected by E. W. Nelson and E. A. Goldman. Original number 14468.

Well-made skin in good condition, with a small bare spot on right shoulder; skull perfect, except for absence of one right upper premolar and three left lower premolars.

Genus MARMOSA.

Marmosa insularis Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XII, pp. 14–15, January 27, 1898.

89215. Skin and skull. Adult male. Maria Madre Island, Tres Marias Islands, Mexico. May 16, 1897. Collected by E. W. Nelson and E. A. Goldman. Original number 11028.

Well-made skin in good condition; skull perfect, except for slightly broken audital bullæ and small perforation in brain case.

Marmosa murina mexicana Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XI, p. 44, March 16, 1897.

71526. Skin and skull. Immature male. Juquila, Oaxaca, Mexico. February 28, 1895. Collected by E. W. Nelson and E. A. Goldman. Original number 7571.

Well-made skin in good condition; skull perfect.

Marmosa oaxacæ Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XI, pp. 43–44, March 16, 1897.

68240. Skin and skull. Adult female. Oaxaca, Oaxaca, Mexico. August 14, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 6571.

Well-made skin in good condition, except for a bare spot on the rump; skull perfect.

Genus METACHIRUS.

Metachirus fuscogriseus pallidus Allen. Biological Survey collection.

Bull. Amer. Mus. Nat. Hist., XIV, pp. 215–217, July 3, 1901.

58158. Skin and skull. Adult male. Orizaba, Vera Cruz, Mexico. January 24, 1894 (not June 24, 1894, as in original description). Collected by E. W. Nelson and E. A. Goldman. Original number 5740.

Well-made skin in good condition; skull perfect.

Order EDENTATA.

Family DASYPODIDÆ.

Genus CABASSOUS.

Tatoua (Ziphila) centralis Miller.

Proc. Biol. Soc. Wash., XIII, p. 4, figs. 1, 2, January 31, 1899.

=**Cabassous centralis** (Miller). See Palmer, Proc. Biol. Soc. Wash., XIII, p. 72, September 28, 1899.

18464/35382. Skin and skull. Adult female. Chamelicon, Honduras. January 8, 1891. Collected by Erich Wittkügel. Original number 8. Catalogued May 23, 1891.

Formerly mounted; now a well-made skin in good condition, nine or ten scales missing from carapace. Skull nearly perfect; somewhat injured about the bullæ. All the teeth in upper jaws lost except first left premolar; all in the lower jaw present except the first left premolar.

Genus TATU.

Tatu novemcinctum texanum Bailey. Biological Survey collection.

North Amer. Fauna, No. 25, pp. 52–56, figs. 5–7, October 24, 1905.

34352/46438. Skin and skull. Adult male. Brownsville, Texas. June 10, 1892 (not 1902 as in original description). Collected by F. B. Armstrong. Original number 4.

Well-made skin in good condition; skull perfect.

Family MYRMECOPHAGIDÆ.

Genus MYRMECOPHAGA.

Myrmecophaga centralis Lyon.

Proc. U. S. Nat. Mus., XXXI, No. 1496, p. 570, pl. 14, figs. 1, 3, November 14, 1906.

15963. Skull (no skin). Young adult. Pacuare, Costa Rica. June, 1876. Collected by José C. Zeledon. Original number 86. Catalogued June 10. 1878.

Skull perfect; no record of a skin.

Order CETE.

Family BALÆNIDÆ.

Genus BALÆNOPTERA.

Balænoptera davidsoni Scammon.

Proc. California Acad. Sci., IV, p. 269, printed in advance, October 4, 1872; TRUE, Smithsonian Contributions to Knowledge, XXXIII, pp. 91 and 293, pl. 25, fig. 1; pl. 23, fig. 1; and pl. 26, fig. 1.

12177. Skull. Adult female. Admiralty Inlet, Puget Sound, Washington. October, 1870. Collected by Capt. C. M. Scammon. Catalogued February 6, 1872.

Skull in good condition.
Type not designated by number. See True, *op. cit.*, p. 91.

Family PHYSETERIDÆ.

Genus KOGIA.

Kogia floweri Gill.

Amer. Nat., IV, p. 738; fig. 167, p. 736, and fig. 172, p. 741, 1871.

8016. Mandible and water-color sketch of entire animal (the "portrait" mentioned by Dr. T. N. Gill). Off Mazatlan, Sinaloa, Mexico. 1868. Collected by Col. A. J. Grayson, U. S. A. Catalogued in 1868.

Posterior end of mandible broken and a few teeth lacking. Water-color sketch (188 by 52 mm.) in good condition.
Type not designated by number. In the original description it is said to be based on "jaw and portrait."

Kogia goodei True.

Bull. U. S. Nat. Mus. No. 27. Great International Fisheries Exhibition, London, 1883. United States of America. H. Catalogue of the Aquatic Mammals exhibited by the U. S. National Museum, p. 630, table, and p. 641, list. *Nomen nudum.*

= **Kogia breviceps** (Blainville). See True, Report U. S. Fish Commission for 1883. Suggestions to Keepers U. S. Life-Saving Stations, etc., relative to collecting and preserving specimens of Whales and Porpoises, pl. 8, fig. 22.

$\frac{13738}{20909}$. Cast of entire animal, and skeleton. Adult female. Spring Lake, New Jersey. Received in the flesh from H. S. Howland, April 27, 1883. Original number of cast 40. Catalogued April 27, 1883.

Cast in good condition; in storage.
Skeleton in good condition; on exhibition.
No description of this species has been published. The name occurs in the table and list cited above. Two specimens are mentioned, the above and one from Florida, represented by the mandible and by photographs.

Family ZIPHIIDÆ.

Genus ZIPHIUS.

Ziphius grebnitzkii Stejneger.

Proc. U. S. Nat. Mus., VI, p. 77, June 22, 1883.

20993. Skull. Bering Island. Autumn of 1882. Collected by Dr. L. Stejneger. Original number 1521. Catalogued November 24, 1883.

Type designated by Dr. L. Stejneger's original number 1521=Museum No. 20993.

Hyperodon semijunctus Cope.

Proc. Acad. Nat. Sci. Phila., 1865, p. 280, ordered published December 26, 1865. *Hyperoodon semijunctus* Cope. See Cope, Proc. Acad. Nat. Sci. Phila., 1869, p. 31.

=**Ziphius cavirostris** G. Cuvier. See True, Proc. U. S. Nat. Mus., VIII, p. 585.

21975. Skeleton. Young female. Charleston Harbor, South Carolina. March, 1861. Collected by Dr. G. E. Manigault. Catalogued July 15, 1885.

Skeleton in fair condition, nearly complete.

Type not designated by number. Described while in possession of the Charleston Museum. Since then acquired by the U. S. National Museum.

Genus MESOPLODON.

Mesoplodon stejnegeri True.

Proc. U. S. Nat. Mus., VIII, p. 584, pl. 25, October 19, 1885.

21112. Cranium. Young. Bering Island. 1883. Collected by Dr. L. Stejneger. Catalogued February 2, 1884.

Tympanic and malar bones lacking, pterygoids imperfect.

Description based on one specimen, mentioned by number.

Genus BERARDIUS.

Berardius bairdii Stejneger. See page 287.

Family DELPHINIDÆ.

Genus PHOCÆNA.

Phocæna dalli True.

Proc. U. S. Nat. Mus., VIII, p. 95, pls. 2–5, May 20, 1885; Bull. U. S. Nat. Mus., No. 36, p. 123, 1889.

21762. Skull. Adult male. Strait west of Adakh Island, Aleutian Group, Alaska. August 13, 1873. Collected by Dr. W. H. Dall. Original number 1554. Catalogued April 23, 1885.

Skull in good condition, but earbones, malars, and upper teeth lacking and one pterygoid broken.

Type not originally designated by number. On page 98 of the original description, measurements are given of "the type skull of *Phocæna Dalli*." On page 125, Bulletin U. S. National Museum, No. 36, the same measurements are given, and the type there indicated as No. 21762.

Phocæna lineata Cope.

Proc. Acad. Nat. Sci. Phila., 1876, p. 134, ordered published June 29, 1876.

= ?**Phocæna phocæna** (Linnæus). See True, Bull. U. S. Nat. Mus., No. 36, p. 118, and also pp. 117, 119, and 120, 1889.

[illegible]. Cast of entire animal, and skull. Hudson River, New York. Received at the U. S. National Museum, February 22, 1876, from John Wallace. Cast (no. 19) catalogued January 20, 1876; skull, April 22, 1879.

Cast and skull in good condition.

"Represented by a single specimen which was taken in the harbor of New York not many months ago, and sent to the Smithsonian Institution where the skeleton is now preserved" (Cope).

Skeleton lost. See True, *op. cit.*, p. 117.

Type not designated by number. Cope refers to but one specimen, the above.

Phocæna vomerina Gill. Cotypes.

Proc. Acad. Nat. Sci. Phila., 1865, p. 178, ordered published September 26, 1865.

= **Phocæna phocæna** (Linnæus). See True, Bull. U. S. Nat. Mus., No. 36, p. 118. 1889.

4149. Rostrum and part of brain-case. Adult. Puget Sound. Collected by Dr. C. B. Kennerly. Catalogued July, 1860.

A little has been cut off the skull behind the orbits. Malars, pterygoids, and teeth lacking.

[illegible]. Skin and skull. Young. San Francisco, California. Collected by Dr. William Stimpson. Catalogued April 20, 1861.

Cotypes not designated by number. The two above specimens are the only ones in the collection having the data given by Dr. T. N. Gill.

Genus PSEUDORCA.

Orca destructor Cope.

Proc. Acad. Nat. Sci. Phila., 1866, p. 293, ordered published October 30, 1866.

= **Pseudorca crassidens** (Owen). See True, Bull. U. S. Nat. Mus., No. 36, p. 143, 1889.

3679. Beak and mandible. Pacific Ocean, off Paita, Peru. Received from Col. E. Jewett (see Smithsonian Report, 1860, p. 80).

In good condition.

Description based upon one specimen, designated by number.

2

Genus GLOBICEPHALUS.

Globiocephalus scammonii Cope.

Proc. Acad Nat. Sci. Phila., p. 21, 1869; Dall in Scammon's Marine Mammals, 1874, p. 299.

=Globicephalus scammoni (Cope). See True, Bull. U. S. Nat. Mus., No. 36, 1889, p. 139.

9074. Skull. "Coast of Lower California in latitude 31°, land 10 miles distant. December 14, 1862." (Scammon, Marine Mammals, 1874, p. 86.) Collected by Capt. C. M. Scammon. Catalogued October 25, 1869.

In good condition.

For considering this specimen the type, see True, *op. cit.*, p. 139 and p. 140.

Two mandibles, Nos. 9075 and 9076, in the National Museum formed part of the original material. They may be considered as paratypes.

Genus GRAMPUS.

Grampus stearnsii Dall.

Proc. California Acad. Sci., V, p. 13, printed in advance January 29, 1873.

=Grampus griseus (Cuvier). See True, Bull U. S. Nat. Mus., No. 36, p. 125, 1889.

13021. Mandible. Monterey, California. Collected by Capt. C. M. Scammon. Catalogued in 1873.

"Two jaws of this animal are in my hands for examination." (Dall in Scammon's Marine Mammals, 1874, p. 299.)

For considering this specimen the type, see True, *op. cit.*, p. 130.

Genus SAGMATIAS.

Sagmatias amblodon Cope.

Proc. Acad. Nat. Sci., Phila., 1866, p. 294, ordered published October 30, 1866; True, Bull. U. S. Nat. Mus., No. 36, p. 106, 1889.

3887. Skull. Old adult. "Caught at sea." Locality unknown. (See Cope and True, *loc. cit.*) Collected by the ship *Vincennes*, of the United States Exploring Expedition. Catalogued June 20, 1860.

Skull in good condition, but one tympanic bone lacking and the other broken, malars lacking and one pterygoid broken.

Type not designated by number. There was but one specimen taken by the ship *Vincennes*, locality not known, but probably between Cape Horn and Lima, Peru, or Australia, or New Zealand. This specimen is No. 3887. See True, *op. cit.*, p. 106, table.

Genus LAGENORHYNCHUS.

Lagenorhynchus gubernator Cope. Cotypes.

Proc. Acad. Nat. Sci. Phila., 1876, p. 138, ordered published June 20, 1876.

=Lagenorhynchus acutus Gray. See True, Bull. U. S. Nat. Mus., No. 36, 1889, p. 83.

12305 and 12306. Plaster casts (No. 2) made and colored from a fresh specimen. Cope remarks: "This delphinoid was taken by the U. S. Fish Commission at near the same locality as the last" [i. e., near Portland, Maine. "The last," *L. perspicillatus*, was *really* from Cape Cod, Massachusetts, but *L. gubernator* was from Casco Bay, near Portland, Maine. F. W. True].

Casts in good condition.

Cotypes not designated by numbers.

Delphinus longidens Cope.

Proc. Acad. Nat. Sci. Phila., 1866, p. 295, ordered published October, 1866.

=**Lagenorhynchus obliquidens** Gill. See True, Bull. U. S. Nat. Mus., No. 36, p. 99, 1889.

3886. Skull. Young adult. Locality unknown. See True, *op. cit.*, p. 99. Collected by the United States Exploring Expedition. Catalogued June 20, 1860.

Skull considerably broken; the malars, earbones, a portion of the pterygoids, and most of the teeth absent.

Type not designated by number. Cope had only one specimen, No. 3886.

Lagenorhynchus obliquidens Gill. Cotypes.

Proc. Acad. Nat. Sci. Phila., 1865, p. 177, ordered published September 26, 1865; True, Bull. U. S. Nat. Mus., No. 36, p. 96, 1889.

1961, 1962, and 1963. Skulls. Pacific Ocean, near San Francisco, California. "Obtained at San Francisco, California." (Gill, *loc. cit.*) Collected by Lieut. W. P. Trowbridge, U. S. A. Catalogued October 24, 1855.

Skulls in good condition, but earbones, all but one malar, and many teeth lacking.

No type designated by Dr. T. N. Gill in the original description. For considering these specimens cotypes, see True, *op. cit.*, p. 98.

Phocæna pectoralis Peale.

U. S. Explor. Exped., VIII, Mamm. and Ornith., p. 32, pl. 6, fig. 1, 1848.

=**Lagenorhynchus electra** Gray. See True, Bull. U. S. Nat. Mus., No. 36, p. 100, 1889.

4108. Mandible. Adult. Hilo Bay, Hawaii. Collected by U. S. Exploring Expedition. No. 32, Peale's list of specimens, *loc. cit.*, p. 305. Catalogued June 26, 1860.

Mandible in good condition; teeth much worn.

Type not designated in the original description, but see True, *op. cit.*, p. 101.

Lagenorhynchus perspicillatus Cope. Cotypes.

Proc. Acad. Nat. Sci. Phila., 1876, p. 136, pl. 4, ordered published June 20, 1876.

=**Lagenorhynchus acutus** Gray. See True, Bull. U. S. Nat. Mus., No. 36, p. 85, 1889.

"This species is represented in the collections of the Smithsonian Institution numerous crania, some skeletons and a colored cast of the natural size, taken the United States Commission of Fisheries, near Portland, Maine" (Cope).

"The foregoing locality is, I believe, incorrect. It should be Woods Hole, Mass., or else Cape Cod. I think cast, No. 12939, Woods Hole, Mass., (original No. 3), and the whole series of skulls and mandibles, Nos. 14228 to 14326, and probably also Nos. 14335 and 14362 to 14373, are to be regarded as cotypes. Two or three of these skulls were missing when the collection was checked up in 1905. No. 14335 is marked 'Skeleton without a head,' but it is on exhibition and there is a skull on it now. This seems to be the only skeleton in the lot." F. W. True.

Genus LISSODELPHIS.

Delphinapterus borealis Peale. See page 287.

Genus DELPHINUS.

Delphinus albimanus Peale.

U. S. Explor. Exped., VIII, Mamm. and Ornith., p. 33, pl. 7, fig. 1, 1848.
=**Delphinus delphis** Linnæus. See True, Bull. U. S. Nat. Mus., No. 36, p. 45, 1889.

$\frac{3743}{4167}$. Mounted skin and jaw. Female. Off the coast of Chile, lat. 27° 16′ S., long. 75° 30′ W. Collected by U. S. ship *Peacock*. No. 31, Peale's list of specimens, *op. cit.*, p. 305. Catalogued June 26, 1860. For further information, see True, *op. cit.*, p. 55.

Mounted specimen is in fair condition for a cetacean skin; the natural color has practically disappeared.

Delphinus albirostratus Peale. See page 287.

Delphinus bairdii Dall. See page 287.

Genus TURSIOPS.

Tursiops gillii Dall.

Proc. California Acad. Sci., V, p. 13, printed in advance, January 29, 1873; Scammon's Marine Mammals, 1874, p. 288; True, Bull. U. S. Nat. Mus., No. 36, p. 43, 1889.

13022. Mandible (no other portion of specimen known to describer) "and outline of animal drawn by Captain Scammon." Young adult. Monterey, California. Collected by Capt. C. M. Scammon.

Mandible in good condition; one tooth lacking.
Outline not found.
Type not designated by number. For regarding this specimen as the type, see True, *op. cit.*, p. 43, footnote.

Genus PRODELPHINUS.

Delphinus lateralis Peale. See page 288.

Delphinus plagiodon Cope.

Proc. Acad. Nat. Sci. Phila., 1866, p. 296, ordered published October 30, 1886.
=**Prodelphinus plagiodon** (Cope). See True, Bull. U. S. Nat. Mus., No. 36, p. 66, 1889.

3884. Skull. Youngish. Locality unknown. Received from J. Varden. Catalogued June 20, 1860.

Skull in good condition; earbones and two teeth lacking, pterygoids incomplete.
Species based on one specimen, No. 3884, mentioned in the original description.

Order UNGULATA

Family BOVIDÆ.

Genus OVIS.

Ovis canadensis auduboni Merriam.

Proc. Biol. Soc. Wash. XIV, p. 31, April 5, 1901.

$\frac{1520}{22610}$. Skin (lost) and skull. Young adult male. "Upper Missouri." Probably collected in the Badlands of South Dakota in 1855 by Dr. F. V. Hayden. Skin of head catalogued June 21, 1856; skull catalogued April 27, 1867.

Skull and horns, No. 22610, in good condition. Catalogue calls for skin of the head, No. 1520, which can not be found.

Ovis montana dalli Nelson. Cotypes.

Proc. U. S. Nat. Mus., VII, p. 12, June 3, 1884.

=**Ovis dalli** (Nelson). See Allen, Bull. Amer. Mus. Nat. Hist., IX, p. 112, April 8, 1897.

In the original description, Mr. Nelson says: "The types of the new race are two specimens brought me by Mr. L. N. McQuesten, a fur trader living at Fort Reliance, on the Upper Yukon River near the point where it crosses the British boundary line. These specimens were killed by the Indians on some mountains south of Fort Yukon and on the west bank of the river." They were taken in the winter of 1879–80. The two cotypes are not designated in the original description by number, but the two specimens that Mr. Nelson had at the time are.

13265. Skin. Adult female.

In fair condition. The catalogues call for a lower jaw No. 20787, now lost. Original number [illegible].

[illegible]. Skin and skull. Adult male.

Skin in fair condition; skull perfect, except slight cutting about foramen magnum. Original number [illegible].

The skins were catalogued January 5, 1881; the skull and lower jaw September 8, 1882.

Both specimens were mounted by Ward's Natural Science Establishment, of Rochester, N. Y., and were on exhibition for many years in the Museum. In April, 1902, these specimens were made into study skins. Each was found to contain a wooden skull to which horns were fastened. These wooden skulls with the attached horns are still in the skins. The horns fastened to the wooden skull of the male skin are slightly larger than the horns belonging to the skull of the same specimen. As the horns of the skull fit the horn-cores it is probable that the horns now on the skin do not naturally belong there, and the true horns of the cotype are those found with the skull. This skull was lost for many years, but was found in the collection January 12, 1905, by Mr. Walter L. Hahn and recognized as a long lost cotype.

Ovis canadensis gaillardi Mearns.

Bull. U. S. Nat. Mus., No. 56, Pt. 1, p. 240, fig. 36, April 13, 1907.

59906. Skin and skull. Immature female. Gila Mountains, between Tinajas Atlas and the Mexican boundary line, in Yuma County, Arizona. February 21, 1894. Collected by Dr. E. A. Mearns, U. S. A. Original number 3029. Catalogued April 13, 1894.

Flat folded skin in good condition; skull somewhat damaged, right horn and part of horn-core knocked off and lost, mandible broken into three pieces. The first permanent molars are in place above, the second molars are just appearing above the alveoli.

Ovis mexicanus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XIV, p. 30, April 5, 1901.

99342. Skin and skull. Adult male. Lake Santa Maria, Chihuahua, Mexico. September 16, 1899. Collected by E. W. Nelson and E. A. Goldman. Original number 13974.

Well-made skin in good condition; skull perfect, except for three broken incisors.

Ovis nelsoni Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XI, p. 218, July 15, 1897.

$\frac{28383}{40487}$. Skin and skull. Adult female. Grapevine Mountains, near lat. 37° N., California-Nevada boundary line. June 4, 1891. Collected by E. W. Nelson. Original number 942.

Well-made skin in good condition; skull perfect, except broken left mandibular ramus.

Genus CEPHALOPHUS.

Cephalophus spadix True.

Proc. U. S. Nat. Mus., XIII, No. 814, p. 227, September 16, 1890.

$\frac{18965}{34707}$. Skin and skull. Adult male. In high altitudes, Mount Kilimanjaro, German East Africa. 1889–90. Collected by Dr. W. L. Abbott. Original number 21. Catalogued June 24, 1890.

Skin in good condition, mounted and now on exhibition; skull perfect.

No type specified, but the entire description is based upon one specimen, the above, designated by number.

Genus REDUNCA.

Cervicapra chanleri Rothschild.

Novitates Zoologicæ, II, p. 53, February, 1895.

=**Redunca chanleri** (Rothschild). See Trouessart, Suppl. Catalogus Mammalium, p. 722, 1904.

$\frac{61868}{46418}$. Skin and skeleton, both mounted and on exhibition. Adult male. On the slopes of the Jambine Mountains, about 45 miles north-northeast of Mount Kenia, British East Africa. (See Sclater and Thomas, Book of Antelopes, II, p. 183, March, 1897.) 1893. Collected by Hon. William Astor Chanler. Catalogued April 5, 1895.

Both skin and skeleton are in good condition.

The specimen was mounted in London by Rowland Ward, Ltd., and while in that establishment was described by Hon. Walter Rothschild, who specifically designated it as the type, although it was not in the collection of the U. S. National Museum at that time.

Genus ANTILOCAPRA.

Antilocapra americana mexicana Merriam. Biological Survey coll.

Proc. Biol. Soc. Wash., XIV, pp. 31-32, April 5, 1901.

98742. Skin and skull. Young adult male. Sierra en Media, Chihuahua, Mexico. October 4, 1899. Collected by E. W. Nelson and E. A. Goldman. Original number 13989.

Well-made skin in good condition; skull perfect.

Family CERVIDÆ.

Genus ODOCOILEUS.

Cervus macrotis californicus Caton. See page 288.

Odocoileus hemionus canus Merriam. Biological Survey coll.

Proc. Wash. Acad. Sci., III, p. 560, November 29, 1901.

99361. Skin and skull. Adult male. Sierra en Media, Chihuahua, Mexico. October 7, 1900. Collected by E. W. Nelson and E. A. Goldman. Original number 13996.

Well-made skin in good condition; skull perfect, except broken incisors.

Odocoileus cerrosensis Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XII, pp. 101-102, April 30, 1898.

80782. Skin and skull. Adult male. Cerros Island, Lower California, Mexico. August 9, 1896. Collected by A. W. Anthony. Original number 113.

Well-made skin in good condition; skull perfect, except for broken left audital bulla.

Cariacus clavatus True.

Proc. U. S. Nat. Mus., XI, p. 417, July 5, 1889. Preoccupied by *Cervus clavatus*. Hamilton Smith (Griffith's Cuvier, Animal Kingdom, V, p. 315, 1827).

=**Odocoileus truei** Merriam. Proc. Biol. Soc. Wash., XII, p. 103, April 30, 1898.

$\frac{16075}{37424}$. Skin and skull. Young adult male. Open pine forests on the Segovia River, about 50 miles from the sea, eastern Honduras. 1887, probably in July or August. Collected by C. H. Townsend. Skin catalogued December 15, 1887; skull May 13, 1898.

Specimen formerly mounted, but since taken down and made into a modern study skin; in good condition. Skull that of a young adult male, with spike

antlers. It is slightly injured about the pterygoids, and only small proximal portions of the premaxillæ remain. All the lower incisors and canines are lost and the tip of the right coronoid process is missing.

No type designated. The greater part of the description is based upon number 16075 in table on page 425, *loc. cit.* This is the specimen which Doctor True states he considered most typical at the time he described the species and on which had been placed the red type label. It is also the specimen which Mr. Gerrit S. Miller, jr., regarded as the type and measured, but did not designate by number. See Proc. Biol. Soc. Wash., XIV, p. 37, footnote, April 25, 1901.

Odocoileus costaricensis Miller.

Proc. Biol. Soc. Wash., XIV, p. 35, April 25, 1901.

$\frac{11385}{13039}$. Skin and skull. Young adult male. Talamanca, between the coast and the foot of the Cordilleras, eastern Costa Rica. Latter part of 1872 or early in 1873. Collected by José C. Zeledon. Received from Prof. W. M. Gabb. Original number 46. Catalogued in 1873.

Specimen has been remade into a modern study skin in good condition. The skull is perfect, except for loss of lower left incisors and canine and first and second right incisors, and the right upper and lower premolars.

Dorcelaphus crooki Mearns.

Preliminary diagnoses of new mammals of the genera Mephitis, Dorcelaphus, and Dicotyles from the Mexican border of the United States, p. 2, February 11, 1897. (Reprinted in Proc. U. S. Nat. Mus., XX, No. 1129, p. 468, December 24, 1897.)

=**Odocoileus crooki** (Mearns). See Thompson, Forest and Stream, LI, p. 286, October 8, 1898.

$\frac{20572}{35762}$. Skull and parts of skin. Adult female. Summit of Dog Mountains, Grant County, New Mexico. June 9, 1892. Collected by Dr. E. A. Mearns, U. S. A. and F. X. Holzner. Original number 1873. International Boundary Commission. Catalogued November 15, 1892.

Skull perfect. The following parts of the skin are present and in good condition: Skin of head, tail, two pieces of body skin, one about 360 by 200 mm., another about 160 by 70 mm., and fore leg and hind leg.

Dorcelaphus hemionus eremicus Mearns.

Preliminary diagnoses of new mammals of the genera Mephitis, Dorcelaphus, and Dicotyles from the Mexican border of the United States, p. 4, February 11, 1897. (Reprinted in Proc. U. S. Nat. Mus., XX, No. 1129, p. 470, December 24, 1897.)

=**Odocoileus hemionus eremicus** (Mearns). See Thompson, Forest and Stream, LI, p. 286, October 8, 1898.

63403. Skin (no skull). Adult male. Sierra Seri, near the Gulf of California, opposite Tiburon Island, in the most arid portion of Sonora, Mexico. December, 1895. Collected by Dr. W J McGee. Catalogued May 4, 1896.

This skin is represented by a rug, well-made and well preserved, and also by a few small fragments, trimmings from the skin, before it was made into a rug. Until March 29, 1902, the skin was owned by Dr. Anita N. McGee, of Washington, D. C., while the small scraps of skin were in the National Museum from the time it was catalogued, May 4, 1896. On March 29, 1902, the skin made up as a rug came into the possession of the Museum.

No type was designated. Doctor Mearns specified three individuals in the original description, namely, skin no. 63403, and two pairs of antlers, nos. 59910 and 60855. The description is based primarily on the skin, and the antlers are mentioned rather incidentally at the end of the description, prefaced by this statement: "It appears to be a larger animal than the mule deer of the Eastern Desert Tract, and unless the specimens brought home by our party are abnormal, its horns are heavier," etc., which seems to indicate that the antlers form but a minor part of the description.

Cervus lewisii Peale. See page 288.

Odocoileus nelsoni Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XII, pp. 103–104, April 30, 1898.

76201. Skin and skull. Two-year-old male. San Cristobal, Chiapas, Mexico. October 1, 1895. Collected by E. W. Nelson and E. A. Goldman. Original number 8524.

Well-made skin in good condition; skull perfect.

Odocoileus columbianus scaphiotus Merriam. Biol. Survey coll.

Proc. Biol. Soc. Wash., XII, p. 101, April 30, 1898.

65162. Skin and skull. Adult male. Laguna Ranch, Gabilan Range, California. April 24, 1894. Collected by J. E. McLellan. Original number 797.

Well-made skin in good condition; skull perfect.

Odocoileus columbianus sitkensis Merriam. Biol. Survey coll.

Proc. Biol. Soc. Wash., XII, pp. 100–101, April 30, 1898.

74383. Skin and skull. Immature female. Sitka, Alaska. August 8, 1895. Collected by C. P. Streator. Original number 4767.

Well-made skin in good condition; skull perfect except slight perforations of palate and audital bullæ; left supraorbital border slightly broken; left paroccipital process broken.

Dorcelaphus texanus Mearns.

Proc. Biol. Soc. Wash., XII, p. 23, January 27, 1898.

=**Odocoileus texanus** (Mearns). See Thompson, Forest and Stream, LI, p. 268, October 8, 1898.

84794. Skin and skull. Adult male. Fort Clark, Kinney County, Texas. December 25, 1897. Collected by Dr. E. A. Mearns, U. S. A. Original number 4288. International Boundary Commission. Catalogued August 22, 1898.

Skin in good condition; skull nearly perfect. Antlers sawed off, but present; most of the right lower incisiform teeth broken off to the alveoli.

Type designated by the original number.

Odocoileus thomasi Merriam. **Biological Survey collection.**

Proc. Biol. Soc. Wash., XII, pp. 102–103, April 30, 1898.

77866. Skin and skull. Adult male. Huehuetan, Chiapas, Mexico. February 22, 1896. Collected by E. W. Nelson and E. A. Goldman. Original number 9359.

Well-made skin in good condition; skull perfect.

Genus MAZAMA.

Mazama pandora Merriam. **Biological Survey collection.**

Proc. Biol. Soc. Wash., XIV, pp. 105–106, July 19, 1901.

108273. Skin and skull. Adult male. Tunkas, Yucatan, Mexico. February 15, 1901. Collected by E. W. Nelson and E. A. Goldman. Original number 14544.

Well-made skin in good condition; skull with repaired fractures of left maxillary and zygomata; anterior part of walls of orbits, left side of palate, pterygoids, and most of vomer absent; last left upper molar missing; otherwise perfect.

Genus CERVUS.

Cervus merriami Nelson.

Bull. Amer. Mus. Nat. Hist., XVI, p. 7, January 16, 1902.

111639. Skin and skull. Adult male. Head of Black River, White Mountains, Arizona. August, 1886. Collected by E. W. Nelson. Catalogued July 11, 1901.

The specimen was in the National Museum for many years without having been entered in the catalogues. The skin had data attached, but the skull was without data and it was not known to belong with the skin until the summer of 1901. In the spring of 1901 the antlers were sawed off the skull. As both antlers and skull were without number or other data, they were thought to be of little value, and no special care was taken of them with the result that the main part of the skull became misplaced. In the summer of 1901 the antlers, in the velvet, were recognized by Mr. Nelson as belonging to the skin which he had collected fifteen years before. A search was made for the skull, but only the lower jaw could be found. Mr. Nelson described the species without the complete specimen. (Cranial characters were obtained, however, from a skull in the American Museum of Natural History, New York City.) In September, 1902, the missing and main part of the skull was found in one of the Museum's storage sheds, where the antlers were originally discovered.

The skin is a tanned pelt, in fair condition, worn summer pelage. The antlers, in velvet, are nearly perfect; one tip is slightly injured. The main part of the skull is perfect. The lower jaw is injured as follows: The crowns of all the incisors and lower canines are broken off and the ascending ramus of the right half of the mandible is broken away.

The skull and antlers are at present hung on the wall of the office of the division of mammals.

Cervus nannodes Merriam. **Biological Survey collection.**

Proc. Biol. Soc. Wash., XVIII, pp. 23–25, February 2, 1905.

[illegible]

[illegible] *bursuvilius.* Kern [illegible] Collected by Dr. C. [illegible] Original number [illegible]

[illegible]

[illegible] Survey collection.

[illegible]

[illegible] Olympic Mountains [illegible] by E. Emmet and [illegible]

[illegible] upper pre- [illegible] imper- [illegible] skull [illegible]

[illegible]

[illegible]

[illegible] Fauna No. 24, p. 29, [illegible]

[illegible] Lake. [illegible] Collected by Dall [illegible] January 24, 1899.

[illegible] The skull [illegible] by the collec- [illegible] in the office of the [illegible]

Genus MUNTIACUS.

***Muntiacus bancanus* Lyon.**

Proc. [illegible] XXXI [illegible] December 18, 1906.

124106. Skin and skull. Adult female. Tanjong Bedaan, Island of Banka, east of Sumatra. June 7, 1904. Collected by Dr. W. L. Abbott. Original number 3296. Catalogued November 30, 1904.

Well made skin in good condition; skull perfect.

Family TRAGULIDÆ.

Genus TRAGULUS.

***Tragulus amœnus* Miller.**

Proc. U. S. Nat. Mus., XXVI, No. 1317, p. 439, February 3, 1903.

114563. Skin and skull. Adult male. Pulo Mansalar, off Tapanuli Bay, west coast of Sumatra. March 8, 1902. Collected by Dr. W. L. Abbott. Original number 1632. Catalogued September 3, 1902.

Well made skin in good condition; skull perfect.

Tragulus bancanus Lyon.

Proc. U. S. Nat. Mus., XXXI, No. 1498, p. 576, December 18, 1906.

124714. Skin and skull. Adult female. Tanjong Tedong, island of Banka, east of Sumatra. May 31, 1904. Collected by Dr. W. L. Abbott. Original number 3283. Catalogued November 30, 1904.

Well-made skin in good condition; skull perfect.

Tragulus batuanus Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 2, November 6, 1903.

121695. Skin and skull. Adult female. Tana Bala, Batu Islands, off west coast of Sumatra. February 5, 1903. Collected by Dr. W. L. Abbott. Original number 2226. Catalogued August 1, 1903.

Well-made skin in good condition; skull perfect.

Type designated as number 121697 an error in cataloguing for 121695, as seen on reference to the original numbers.

Tragulus billitonus Lyon.

Proc. U. S. Nat. Mus., XXXI, No. 1498, p. 578, December 18, 1906.

124929. Skin and skull. Adult male. Tanjong Batu, Billiton Island, east of Sumatra. July 20, 1904. Collected by Dr. W. L. Abbott. Original number 3524. Catalogued December 5, 1904.

Well-made skin in good condition; skull perfect, except right upper canine broken off at alveolus.

Tragulus borneanus Miller.

Proc. Biol. Soc. Wash., XV, p. 174, August 6, 1902.

$\frac{19205}{34924}$. Skin and skull. Adult male. Banks of Suanlamba River, British North Borneo. January 18, 1888. Collected by C. F. Adams. Original number K I=154. Catalogued December 5, 1890.

Skin in fair condition; formerly mounted and on exhibition; the original color much injured by pickling fluid and exposure to light; skull perfect.

When this species was described, the skin could not be found. At that time it was mounted and in storage. In April, 1907, it was made into a study skin.

Tragulus brevipes Miller.

Proc. U. S. Nat. Mus., XXVI, No. 1317, p. 443, February 3, 1903.

114326. Skin and skull. Adult female. Pulo Bangkaru, Banjak Islands. January 20, 1902. Collected by Dr. W. L. Abbott. Original number 1443. Catalogued August 28, 1902.

Well-made skin in good condition; skull perfect.

Tragulus bunguranensis Miller.

Proc. Wash. Acad. Sci., III, p. 113, March 26, 1901.

104604. Skin and skull. Adult male. Bunguran Island, Natuna Islands. July 9, 1900. Collected by Dr. W. L. Abbott. Original number 547. Catalogued December 15, 1900.

Well made skin in good condition; skull perfect.

Tragulus canescens Miller.

Proc. Biol. Soc. Wash., XIII, p. 185, December 21, 1900.

83509. Skin and skull. Adult female. Trong (or Tarang), lower Siam. September 7, 1896. Collected by Dr. W. L. Abbott. Catalogued April 24, 1897.

Well-made skin in good condition; skull perfect except for loss of right upper canine.

Tragulus carimatæ Miller.

Proc. U. S. Nat. Mus., XXXI, No. 1481, p. 55, July 23, 1906.

125062. Skin and skull. Young adult female. Telok Pai, Karimata Island, off west coast of Borneo. August 25, 1904. Collected by Dr. W. L. Abbott. Original number 3651. Catalogued December 8, 1904.

Well-made skin in good condition; skull perfect.

Tragulus flavicollis Miller.

Proc. Biol. Soc. Wash., XVI, p. 33, March 19, 1903.

115505. Skin and skull. Immature female. Pulo Sugi, Rhio-Linga Archipelago. August 24, 1902. Collected by Dr. W. L. Abbott. Original number 1957. Catalogued December 27, 1903.

Well-made skin in good condition; skull perfect.

Tragulus focalinus Miller.

Proc. Biol. Soc. Wash., XVI, p. 35, March 19, 1903.

120574. Skin and skull. Adult female. Near Buitenzorg, Java. October or November, 1902. Received from B. S. Rairden, U. S. consul at Batavia. Catalogued January 25, 1903.

Well made skin in good condition; skull nearly perfect; all the incisiform teeth lost except left lower canine.

Tragulus formosus Miller.

Proc. Biol. Soc. Wash., XVI, p. 34, March 19, 1903.

115511. Skin and skull. Adult male. Pulo Bintang, Rhio-Linga Archipelago. August 19, 1902. Collected by Dr. W. L. Abbott. Original number 1907. Catalogued December 27, 1902.

Well-made skin in good condition; skull perfect, except right upper canine and left incisiform teeth slightly chipped.

Tragulus jugularis Miller.

Proc. U. S. Nat. Mus., XXVI, No. 1317, p. 440, February 3, 1903.

114574. Skin and skull. Adult male. Pulo Mansalar, off Tapanuli Bay, west coast of Sumatra. March 8, 1902. Collected by Dr. W. L. Abbott. Original number 1627. Catalogued September 3, 1902.

Well-made skin in good condition; skull perfect.

Tragulus lampensis Miller.

Proc. Biol. Soc. Wash., XVI, p. 42, March 19, 1903.

104429. Skin and skull. Adult female. Pulo Lampee or Sullivan Island, Mergui Archipelago. February 4, 1900. Collected by Dr. W. L. Abbott. Original number 299. Catalogued November 6, 1900.

Well-made skin in good condition; skull perfect.

Tragulus lancavensis Miller.

Proc. Biol. Soc. Wash., XVI, p. 41, March 19, 1903.

104412. Skin and skull. Adult female. Pulo Lankawi, off west coast of Malay Peninsula (about 75 miles north of Penang). December 7, 1899. Collected by Dr. W. L. Abbott. Original number 132. Catalogued November 6, 1900.

Well-made skin in good condition; skull perfect.

Tragulus luteicollis Lyon.

Proc. U. S. Nat. Mus., XXXI, No. 1498, p. 579, December 18, 1906.

124733. Skin and skull. Adult male. Tanjong Bedaan, island of Banka, east of Sumatra. June 12, 1904. Collected by Dr. W. L. Abbott. Original number 3311. Catalogued November 30, 1904.

Well-made skin in good condition; skull perfect.

Tragulus lutescens Miller.

Proc. Biol. Soc. Wash., XVI, p. 32, March 19, 1903.

115507. Skin and skull. Adult male. Pulo Sugi Bawa, Rhio-Linga Archipelago. September 2, 1902. Collected by Dr. W. L. Abbott. Original number 2011. Catalogued December 27, 1902.

Well-made skin in good condition; skull perfect.

Tragulus natunæ Miller.

Proc. Biol. Soc. Wash., XVI, p. 38, March 19, 1903.

104614. Skin and skull. Adult female. Bunguran Island, Natuna Islands. July 9, 1900. Collected by Dr. W. L. Abbott. Original number 555. Catalogued December 15, 1900.

Well-made skin in good condition; skull perfect.

Tragulus nigricollis Miller.

Proc. Acad. Nat. Sci. Phila., 1902, p. 145, June 11, 1902.

113121. Skin and skull. Adult male. Sinkep Island, Rhio-Linga Archipelago. September 6, 1901. Collected by Dr. W. L. Abbott. Original number 1292. Catalogued January 30, 1902.

Well-made skin in good condition; skull perfect.

Tragulus nigrocinctus Miller.

Proc. U. S. Nat. Mus., XXXI, No. 1485, p. 250, September 11, 1906.

122863. Skin and skull. Adult male. Pulo Kundur, Rhio-Linga Archipelago. June 21, 1903. Collected by Dr. W. L. Abbott. Original number 2531. Catalogued January 21, 1904.

Well-made skin in good condition; skull perfect.

Tragulus pallidus Miller.

Proc. Wash. Acad. Sci., III, p. 116, March 26, 1901.

104616. Skin and skull. Adult female. Pulo Laut, Natuna Islands. August 11, 1900. Collected by Dr. W. L. Abbott. Original number 625. Catalogued December 15, 1900.

Well-made skin in good condition; skull perfect, except slight damage in left temporal region.

Tragulus perflavus Miller.

Proc. U. S. Nat. Mus., XXXI, No. 1485, p. 251, September 11, 1906.

142125. Skin and skull. Adult female. Semimba Bay, Batam Island, Rhio-Linga Archipelago. September 21, 1905. Collected by C. Boden Kloss. Original number 28. Catalogued January 8, 1906.

Well-made skin in good condition; skull perfect.

Tragulus pretiellus Miller.

Proc. U. S. Nat. Mus., XXXI, No. 1485, p. 253, September 11, 1906.

122994. Skin and skull. Adult male. Pulo Bakong, Rhio-Linga Archipelago. July 18, 1903. Collected by Dr. W. L. Abbott. Original number 2643. Catalogued January 23, 1904.

Well-made skin in good condition; skull perfect.

Tragulus pretiosus Miller.

Proc. Acad. Nat. Sci. Phila., 1902, p. 144, June 11, 1902.

113031. Skin and skull. Adult male. Linga Island, Rhio-Linga Archipelago. August 27, 1901. Collected by Dr. W. L. Abbott. Original number 1238. Catalogued January 25, 1902.

Well-made skin in good condition; skull perfect, except points of upper canines broken and a small shot hole in base of nasals.

Tragulus ravulus Miller.

Proc. Biol. Soc. Wash., XVI, p. 41, March 19, 1903.

104417. Skin and skull. Adult female. Pulo Adang, Butang Islands, off west coast of Malay Peninsula. December 16, 1899. Collected by Dr. W. L. Abbott. Original number 161. Catalogued November 6, 1900.

Well-made skin in good condition; skull perfect.

Type designated by number 104717, which is an error for 104417.

Tragulus ravus Miller.

Proc. Biol. Soc. Wash., XV, p. 173, August 6, 1902.

83506. Skin and skull. Immature female. Trong (or Tarang), lower Siam. September 6, 1896. Collected by Dr. W. L. Abbott. Catalogued April 24, 1897.

Well-made skin in good condition; skull perfect, except for loss of small right upper canine. Milk molars in place, much worn; last permanent molars not up.

Tragulus rubeus Miller.

Proc. Biol. Soc. Wash., XVI, p. 40, March 19, 1903.

115522. Skin and skull. Adult female. Pulo Bintang, Rhio-Linga Archipelago. August 20, 1902. Collected by Dr. W. L. Abbott. Original number 1914. Catalogued December 27, 1902.

Well-made skin in good condition; skull perfect.

Tragulus rufulus Miller.

Proc. Wash. Acad. Sci., II, p. 227, August 20, 1900.

101767. Skin and skull. Young adult male. Tioman Island, off southeast coast of Malay Peninsula. September 30, 1899. Collected by Dr. W. L. Abbott. Catalogued January 20, 1900.

Well-made skin in good condition; skull perfect, except for loss of both upper canines.

Tragulus russeus Miller.

Proc. U. S. Nat. Mus., XXVI, No. 1317, p. 444, February 3, 1903.

114337. Skin and skull. Adult male. Pulo Tuangku, Banjak Islands, off west coast of Sumatra. February 5, 1902. Collected by Dr. W. L. Abbott. Original number 1518. Catalogued August 28, 1902.

Well-made skin in good condition; skull perfect.

Tragulus russulus Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 3, November 6, 1903.

121701. Skin and skull. Adult male. Tana Bala, Batu Islands, off west coast of Sumatra. February 8, 1903. Collected by Dr. W. L. Abbott. Original number 2249. Catalogued August 1, 1903.

Well-made skin in good condition; skull perfect.

Tragulus subrufus Miller.

Proc. Biol. Soc. Wash., XVI, p. 39, March 19, 1903.

113119. Skin and skull. Adult female. Sinkep Island, Rhio-Linga Archipelago. September 5, 1901. Collected by Dr. W. L. Abbott. Original number 1285. Catalogued January 30, 1902.

Well-made skin in good condition; skull perfect, except left upper canine lost.

Tragulus umbrinus Miller.

Proc. Biol. Soc. Wash., XIII, p. 191, December 21, 1900.

104414. Skin and skull. Adult male. Pulo Lankawi, off west c of Malay Peninsula. December 7, 1899. Collected by Dr. W Abbott. Original number 134. Catalogued November 6, 190

Well-made skin in good condition, except for a break about the left c joint; skull perfect.

Tragulus virgicollis Miller.

Proc. Biol. Soc. Wash., XVI, p. 37, March 19, 1903.

=Tragulus hosei Bonhote. See Lyon, Proc. U. S. Nat. Mus., XXXIII, No. p. 549, December 24, 1907.

83941. Skin and skull. Adult male. Altitude of 3,000 feet on M Dulit, Sarawak, Borneo. June, 1895. Collected by Ernest I and Charles Hose. Catalogued December 7, 1897.

Well-made skin in good condition; skull nearly perfect, left coronoid pr of mandible broken off, all incisiform teeth lost except left lower canine.

Family SUIDÆ.

Genus SUS.

Sus babi Miller.

Proc. U. S. Nat. Mus., XXX, No. 1466, p. 752, plates 60, 61, June 13, 1906

114283. Skin and skull. Adult male. Pulo Babi (an island al half way between Simalur and Pulo Bangkuru, the outermos the Banjak group), west coast of Sumatra. January 14, 1 Collected by Dr. W. L. Abbott. Original number 1413. C logued August 27, 1902.

Flat, folded skin in good condition; skull perfect.

Sus jubatulus Miller.

Proc. U. S. Nat. Mus., XXX, No. 1466, p. 746, June 13, 1906.

123918. Skin and skull. Adult male. Pulo Terutau (also wri Trotau and Trotto), off west coast of Malay Peninsula. Nov ber 11, 1903. Collected by Dr. W. L. Abbott. Original nun 2859. Catalogued July 22, 1904.

Flat, folded skin in good condition; skull perfect.

Sus jubatus Miller.

Proc. U. S. Nat. Mus., XXX, No. 1466, p. 745, pls. 55, 56, 58, 59, June 13,

83518. Skin and skull. Adult male. Trong (or Tarang), lower S 1896. Collected by Dr. W. L. Abbott. Original number ' Catalogued April 28, 1897.

Well-made skin in good condition; skull perfect.

Sus mimus Miller.

Proc. U. S. Nat. Mus., XXX, No. 1466, p. 753, June 13, 1906.

114178. Skin and skull. Adult male. Simalur Island, west coast of Sumatra. November 25, 1901. Collected by Dr. W. L. Abbott. Original number 1353. Catalogued August 26, 1902.

Flat, folded skin in good condition; skull perfect.

Sus natunensis Miller.

Proc. Wash. Acad. Sci., III, p. 117, March 26, 1901.

104856. Skin and skull. Adult female. Pulo Laut, Natuna Islands. August 6, 1900. Collected by Dr. W. L. Abbott. Original number 609. Catalogued December 20, 1900.

Well-made skin in good condition; skull perfect.

Sus niadensis Miller.

Proc. U. S. Nat. Mus., XXX, No. 1466, p. 751, pls. 62–64, June 12, 1906.

141167. Skin and skull. Adult female. Nias Island, off west coast of Sumatra. March 30, 1905. Collected by Dr. W. L. Abbott. Original number 4155. Catalogued July 20, 1905.

Flat, folded skin in good condition; skull perfect.

Sus nicobaricus Miller.

Proc. U. S. Nat. Mus., XXIV, No. 1269, p. 755, May 28, 1902.

111794. Skin and skull. Young adult male. Great Nicobar Island, Nicobar Islands. March 13, 1902. Collected by Dr. W. L. Abbott. Original number 930. Catalogued August 14, 1901.

Well-made skin in good condition; skull perfect.

Sus oi Miller.

Proc. Biol. Soc. Wash., XV, p. 51, March 5, 1902.

113150. Skin and skull. Adult male. Banks of the Indragiri River, about 30 miles above the mouth, eastern Sumatra. September 20, 1901. Collected by Dr. W. L. Abbott. Original number 1319. Catalogued February 3, 1902.

Well-made skin in good condition; skull perfect.

Sus peninsularis Miller.

Proc. U. S. Nat. Mus., XXX, No. 1466, p. 749, pl. 57, June 13, 1906.

142470. Skull only. Adult female. Near foot of Gunong Pulai, southwestern Johore. 1905. Collected by C. Boden Kloss. Catalogued January 26, 1906.

Skull perfect, except loss of four upper incisors and tip of left paroccipital process.

Sus rhionis Miller.

Proc. U. S. Nat Mus., XXX, No. 1466, p. 749, pls. 60, 61, 64, June 13, 1906.

122928. Skin and skull. Young adult male. Pulo Ungar, Rhio-Linga Archipelago. June 26, 1903. Collected by Dr. W. L. Abbott. Original number 2555. Catalogued January 22, 1904.

Flat, folded skin in good condition; skull perfect.

Family TAYASSUIDÆ.

Genus TAYASSU.

Tayassu angulatus crassus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XIV, p. 124, July 19, 1901.

=**Tayassu angulatum crassum** Merriam. See Miller and Rehn, Proc. Bost. Soc. Nat. Hist., XXXI, p. 66, 1903.

92960. Skin and skull. Young adult male. Metlaltoyuca, Puebla, Mexico. February 1, 1898. Collected by E. W. Nelson and E. A. Goldman. Original number 12127.

Well-made skin in good condition; skull perfect except for absence of right outer upper and lower incisors; left postglenoid process broken.

Tayassu angulatus humeralis Merriam. Biological Survey coll.

Proc. Biol. Soc. Wash., XIV, pp. 122–123, July 19, 1901.

=**Tayassu angulatum humerale** Merriam. See Miller and Rehn, Proc. Bost. Soc. Nat. Hist., XXXI, p. 66, 1903.

$\frac{33238}{45243}$. Skin and skull. Adult male (not female, as in original description). Armeria, Colima, Mexico. February 26, 1892. Collected by E. W. Nelson and E. A. Goldman. Original number 1947.

Well-made skin in good condition; skull perfect except for several small punctures in audital bullæ.

Tayassu nanus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XIV, p. 102, July 19, 1901.

108516. Skin and skull. Adult male. Cozumel Island, Yucatan, Mexico. April 7, 1901. Collected by E. W. Nelson and E. A. Goldman. Original number 14664.

Well-made skin in good condition; skull perfect.

Tayassu albirostris ringens Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XIV, pp. 121–122, July 19, 1901.

=**Tayassu pecari ringens** (Merriam). See Allen, Bull. Amer. Mus. Nat. Hist., XVI, p. 166, July 19, 1902.

108279. Skin and skull. Adult female. Apazote, near Yohaltun, Campeche, Mexico. January 1, 1901. Collected by E. W. Nelson and E. A. Goldman. Original number 14383.

Well-made skin in good condition; skull perfect.

Dicotyles angulatus sonoriensis Mearns.

Preliminary diagnoses of new mammals of the genera Mephitis, Dorcelaphus, and Dicotyles, from the Mexican border of the United States, p. 3, February 11, 1897. (Reprinted in Proc. U. S. Nat. Mus., XX, No. 1129, p. 469, December 24, 1897.)

=**Tayassu angulatum sonoriense** (Mearns). See Miller and Rehn, Proc. Bost. Soc. Nat. Hist., XXX, p. 12, 1901.

$\frac{20657}{35814}$. Skin and skull. Adult male. San Bernardino River, Sonora, Mexico, near monument No. 77, Mexican boundary line. September 8, 1892. Collected by Dr. E. A. Mearns, U. S. A., and F. X. Holzner. Original number 2099. International Boundary Commission. Catalogued December 13, 1892.

Poorly-made skin (laid out on side) in good condition; skull perfect, except for loss of angular process of right half of mandible.

Tayassu angulatus yucatanensis Merriam. Biological Survey coll.

Proc. Biol. Soc. Wash., XIV, p. 123. July 19, 1901.

=**Tayassu angulatum yucatanense** Merriam. See Miller and Rehn, Proc. Bost. Soc. Nat. Hist., XXXI, p. 66, 1903.

108282. Skin and skull. Young adult male. Tunkas, Yucatan, Mexico. February 12, 1901. Collected by E. W. Nelson and E. A. Goldman. Original number 14534.

Well-made skin in good condition; skull perfect, except for absence of left outer upper incisor and slight puncture of right audital bulla; left parietal slightly cracked.

Family TAPIRIDÆ.

Genus TAPIRELLA.

Elasmognathus bairdii Gill.

Proc. Acad. Nat. Sci. Phila., 1865, p. 183, presented at meeting of October 10, 1865.

=**Tapirella bairdii** (Gill). See Elliot, Land and Sea Mammals of Middle America and West Indies, Field Columbian Mus., Zool. Ser., IV, p. 87, 1904.

6019. Skull, no skin. Isthmus of Panama. Collected by Dr. W. S. White. Catalogued April 9, 1863.

Skull in good condition, except that it has been cut in two longitudinally and that the following teeth are lost: The two middle upper incisors, the second left upper premolar, the first left upper molar, the third right upper premolar, and the third right lower incisor.

Dr. T. N. Gill designated no type-specimen. The description is based upon two skulls, adult and young, collected on the Isthmus of Panama by Dr. W. S. White. Two such specimens exist in the National Museum, entered in the catalogue April 9, 1863. The adult is here regarded as the type. In the original

description, Dr. Gill speaks of the vomer and the nasal septum, both of which are wanting in the younger specimen, and it is reasonable to assume that the remainder of the description is based upon the older and more perfect skull.

Elasmognathus dowii Gill.

Amer. Jour. Sci. and Arts, 2d Ser., L, p. 142, 1870.

=**Tapirella dowii** (Gill). See Elliot, Land and Sea Mammals Middle America and West Indies, Field Columbian Mus., Zool. Ser., IV, p. 83, 1904.

11278. Skull, no skin. Nearly adult. Guatemala. Collected by Capt. J. M. Dow. Original number 1. Catalogued July 19, 1870.

Skull nearly perfect, but vomer lost, and the following teeth are missing: The two first upper premolars and the two first lower premolars; all the upper incisors and canines, except the third right incisor. The last four molars are not yet level with the alveoli.

Type not designated by number. The original description refers to four adults and one young in the Smithsonian collection, all obtained by Capt. John M. Dow. These five specimens are found to be numbers 11278–9, 11280–1–2, bearing original numbers 1, 2, 3, 4, and 5. The title of Dr. Gill's article is "A new species of Tapir, from Guatemala." It happens that but one of five specimens came from Guatemala, namely, the first, no. 11278, and that one shows the reduced fused nasals emphasized in the description better than any of the others. This specimen is plainly marked "Guatemala" in old lettering on the skull; the other four are marked "Salvador, C. A." In the catalogue, number 11278 was first entered as "Salvador, C. Am.," but the "Salvador" has a line drawn through it and "Guatemala" written above. The other four are marked "Salvador." In view of the above facts, Cat. No. 11278 must be regarded as the type.

Family PROCAVIIDÆ.

Genus DENDROHYRAX.

Dendrohyrax validus True.

Proc. U. S. Nat. Mus., XIII, No. 814, p. 228, September 16, 1890.

$\frac{18986}{34721}$. Skin and skull. Adult male. Mount Kilimanjaro, German East Africa. June 17, 1888. Collected by Dr. W. L. Abbott. Original number 8. Catalogued June 24, 1890.

Well-made skin in good condition; skull perfect, except for the following injuries to teeth: Two middle lower incisors broken off at alveoli, also first lower left premolar, both upper incisors, first three upper premolars right side, and first two upper premolars left side all broken or worn off to the alveoli.

No type designated. Five specimens are listed by number, of which $\frac{18986}{34721}$ is here chosen as the type because, first, it heads the list; second, it is the only one of which a table of skull measurements is given; third, it is the only specimen coming from Mount Kilimanjaro, the other four coming from Taveta, and the title of the paper reads, "Description of two new species of mammals from Mt. Kilimanjaro, East Africa."

The designation of the skull number 25796 in the original description is due to an error made in the cataloguing. It has been corrected to 34721.

Order GLIRES

Family LEPORIDÆ.

Genus LEPUS.

Lepus merriami altamiræ Nelson. Biological Survey collection.

Proc. Biol. Soc. Wash., XVII, pp. 109–110, May 18, 1904.

93691. Skin and skull. Adult male. Alta Mira, Tamaulipas, Mexico. May 16, 1898. Collected by E. W. Nelson and E. A. Goldman. Original number 12365.

Well-made skin in good condition; skull perfect, except for absence of second right upper molar, broken postorbital processes, and two perforations of the brain case.

Lepus asellus Miller.

Proc. Acad. Nat. Sci. Phila., 1899, p. 380, October 5, 1899.

$\frac{20885}{36009}$. Skin and skull. Adult female. San Luis Potosi, Mexico. October 22, 1891. Collected by P. L. Jouy. Original number 270. Catalogued May 22, 1893.

Well-made skin in good condition; skull perfect, except for some pieces broken out of ascending ramus of left half of mandible.

Lepus bairdi Hayden. Cotype.

Amer. Nat., III, p. 115, May, 1869.

=Lepus americanus bairdi (Hayden). See True, Proc. U. S. Nat. Mus., VII, p. 601, 1885.

No type designated. The description is based upon specimens collected in the Columbia Valley, Wind River Mountains, near Fremonts Peak, long. 110°, lat. 43°, Fremont County, Wyoming, in the first part of June, 1860, by Dr. F. V. Hayden.

The specimens, excluding three marked young in the catalogue, are as follows:

$\frac{4262}{38001}$. Male. June 2, 1860. Original number 62. Made over into fairly good study skin, March, 1902. Posterior and basal parts of brain case broken away and both ascending parts of mandible more or less injured.

$\frac{4263}{4273}$. June 2, 1860. Original number 63. Neither skin nor skull can be found.

4264. Skin without skull. June 4, 1860. Original number 90. Skin can not be found.

Catalogued November, 1860, except skull no. 38001, catalogued March 22, 1902.

Lepus arcticus canus Preble. Biological Survey collection.

North Amer. Fauna, No. 22, pp. 59–61, October 31, 1902.

106860. Skin and skull. Immature male. Barren grounds near Hubbart Point, about 75 miles north of Fort Churchill, Keewatin,

Canada. August 17, 1900. Collected by E. A. Preble. Original number 3347.

Well-made skin in good condition; skull with right side of maxillary injured; ends of nasals (about one-third) broken away; right condyle imperfect and lower side of right mandibular ramus injured.

Lepus americanus dalli Merriam.

Proc. Wash. Acad. Sci., II, p. 29, March 14, 1900.

$\frac{8226}{7679}$. Skin and skull. Adult male. Nulato, Alaska. January 27, 1867. Collected by Dr. W. H. Dall. Original number 584. Western Union Company's Overland International Telegraph Expedition. Catalogued January 15, 1868.

Unfilled skin in winter pelage, in rather poor condition; skull perfect.

Type designated by the skull number. Skin was not known to exist at time of publication of description.

Lepus festinus Nelson. Biological Survey collection.

Proc. Biol. Soc. Wash., XVII, pp. 108–109, May 18, 1904.

53490. Skin and skull. Adult male. Irolo, Hidalgo, Mexico. March 31, 1893. Collected by E. W. Nelson and E. A. Goldman. Original number 4522.

Well-made skin in good condition; skull perfect.

Lepus gaillardi Mearns.

Proc. U. S. Nat. Mus., XVIII, No. 1081, p. 560, June 24, 1896.

$\frac{20525}{35714}$. Skin and skull. Adult male. West fork of the Playas Valley, near monument No. 63, Mexican boundary line. June 17, 1892. Collected by Dr. E. A. Mearns, U. S. A., and F. X. Holzner. Original number 1885. International Boundary Commission. Catalogued November 5, 1892.

Well-made skin in good condition; pelage somewhat worn. Skull has lost the left bulla and the outer anterior margin of the nasals are somewhat broken, as is also the condyloid process of the left half of mandible.

Lepus texianus griseus Mearns.

Proc. U. S. Nat. Mus., XVIII, No. 1081, p. 562, June 24, 1896.

$\frac{21068}{36108}$. Skin and skull. Adult female. Fort Hancock, El Paso County, Texas. June 22, 1893. Collected by Dr. E. A. Mearns, U. S. A. Original number 2353. International Boundary Commission. Catalogued July 29, 1893.

Well-made skin in good condition, but made up lying on the side instead of belly; skull perfect.

Lepus klamathensis Merriam. Biological Survey collection.

North Amer. Fauna, No. 16, pp. 100–101, October 28, 1899.

92248. Skin and skull. Adult female. Fort Klamath, Oregon. January 25, 1898. Collected by B. L. Cunningham. Original number 1191x.

Well-made skin in good condition; skull perfect, except for slight injury to upper border of foramen magnum and angle of left mandibular ramus.

Lepus labradorius Miller. Cotypes.

Proc. Biol. Soc. Wash., XIII, p. 39, May 29, 1899.

14149. Skin. Adult. Fort Chimo, Ungava, Labrador. September 28, 1882. Collected by Lucien M. Turner. Original number 1180. This skin should have a skull, 37138, which can not be found. Skin catalogued February 2, 1884; skull, April, 1896.

Skin is well made and in good condition, pelage somewhat worn.

23132. Skull only. Adult. Same place and collector as above. Original number 2326. Catalogued January 12, 1889.

Except for loss of the two left upper incisors, the skull is perfect.

Both cotypes are designated by number. There is a typographical error in the skull number. It should be 23132 instead of 32132.

Lepus americanus macfarlani Merriam.

Proc. Wash. Acad. Sci., II, p. 30, March 14, 1900.

$\frac{7111}{14467}$. Skin (lost) and skull. Adult male. Fort Anderson, Mackenzie, Canada. March, 1863. Collected by R. MacFarlane. Original number 319. Skull catalogued May 6, 1875; skin in 1864 or 1865.

Angular process of right half of mandible somewhat broken, and posterior edge of left half of mandible more or less injured; otherwise, skull in good condition. Catalogue calls for skin no. 7111, which can not now be found.

Lepus californicus magdalenæ Nelson. Biological Survey collection.

Proc. Biol. Soc. Wash., XX, p. 81, July 22, 1907.

146168. Skin and skull. Adult male. Magdalena Island, Lower California, Mexico. November 26, 1905. Collected by E. W. Nelson and E. A. Goldman. Original number 18638.

Well-made skin in good condition; skull perfect, except for absence of left post-orbital process.

Lepus merriami Mearns.

Preliminary Diagnoses of New Mammals from the Mexican Border of the United States, p. 2, March 25, 1896. (Reprinted in Proc. U. S. Nat. Mus., XVIII, No. 1075, p. 444, May 23, 1896.)

83797. Skin and skull. Adult female. Fort Clark, Kinney County, Texas. April 6, 1893. Collected by Dr. E. A. Mearns, U. S. A. Original number 2317. International Boundary Commission. Catalogued September 11, 1897.

Skin well-made and preserved, but made up on its side instead of belly; skull perfect, except for loss of the last upper molar on each side.

Type designated by the collector's original number.

Lepus othus Merriam.

Proc. Wash. Acad. Sci., II, p. 28, March 14, 1900.

15883. Skull, no skin. Adult. St. Michael, Alaska. February, 1877. Collected by Lucien M. Turner. Original number 1418. Catalogued December 11, 1877.

Left half of mandible is lost and a small piece is out of the condyloid process of the right half; the last right and left upper molars missing; otherwise, skull in good condition.

Lepus poadromus Merriam. Biological Survey collection.

Proc. Wash. Acad. Sci., II, p. 29, March 14, 1900.

98068. Skin and skull. Adult. Stepovak Bay, Alaska Peninsula, Alaska. July 8, 1899. Collected by C. Palache. Original number 2207 (Dr. A. K. Fisher).

Well-made skin in good condition, except for absence of left hind foot; skull perfect, except for broken left zygoma.

Lepus saliens Osgood. Biological Survey collection.

North Amer. Fauna, No. 19, pp. 39–40, October 6, 1900.

98956. Skin and skull. Adult male. Caribou, Yukon, Canada. June 26, 1899. Collected by W. H. Osgood. Original number 504.

Well-made skin in good condition; skull with numerous small shot perforations; right zygoma broken; anterior portion of vault of cranium, left mandibular condyle, and left lower incisor missing.

Lepus campestris sierræ Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XVII, pp. 132–133, July 14, 1904.

67863. Skin and skull. Adult female. Hope Valley, Alpine County, California. September 9, 1894. Collected by F. Stephens. Original number 1889.

Well-made skin in good condition; skull, posterior portion of brain case, including audital bullæ and basioccipital, missing; right mandibular ramus broken in front of molar series.

Lepus tularensis Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XVII, pp. 136–137, July 14, 1904.

126334. Skin and skull. Adult female. Alila, Tulare County, California. October 25, 1900. Collected by L. J. Goldman. Original number 496.

Well-made skin in good condition; skull perfect.

Lepus varronis Miller.

Proc. Biol. Soc. Wash., XIV, p. 97, June 27, 1901.

105832. Skin and skull. Adult male. Heinzenberg, Canton of Graubünden, Switzerland. December 5, 1900. Collected by Ernst H. Zollikofer. Original number 196. Catalogued June 5, 1901.

Well-made skin in good condition; skull perfect.

Lepus texianus wallawalla Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XVII, p. 137, July 14, 1904.

$\frac{23923}{31328}$ (not $\frac{23923}{21328}$ as in original description). Skin and skull. Adult female. Touchet, Washington. September 18, 1890. Collected by C. P. Streator. Original number 271.

Well-made skin in good condition; skull perfect, except for absence of left supraorbital processes.

Lepus washingtoni Baird.

Proc. Acad. Nat. Sci. Phila., VII, p. 333; this paper was favorably reported for publication, April 24, 1855.

1223. Skull. Adult. Steilacoom, Washington. April 1, 1854. Collected by Dr. George Suckley. Catalogued November 9, 1854.

All four occipitals, the interparietal, tympanic, and mastoid bones of the skull are wanting, and the ascending rami of the mandible are more or less broken on the posterior edge. Otherwise the skull is in good condition. There should be a skin, no. 280, which can not now be found.

Type not designated by number, but by comparing the measurements of the original description with those in the table on page 585 of Baird's Mammals of North America it is seen that No. $\frac{280}{1223}$ must be regarded as the type.

Genus SYLVILAGUS.

Lepus sylvaticus arizonæ Allen.

Monographs of North American Rodentia, p. 349, August, 1877.

=Sylvilagus arizonæ (Allen). See Lyon, Smithsonian Miscell. Coll., XLV, No. 1456, p. 336, June 15, 1904.

8439. Skin of adult male. No record of skull. Beales Springs, 50 miles west of Fort Whipple, Yavapai County, Arizona. September 8, 1865. Collected by Dr. Elliott Coues. Original number 1563. Catalogued February 16, 1866.

A flat, poorly preserved skin; one hind leg missing; the other detached from the skin.

Type not explicitly designated by number, but on comparing Doctor Allen's remarks, p. 332, *loc. cit.*, with the list of specimens in Table 39, p. 340, it is readily seen that 8439 is the type.

Lepus audubonii Baird. See page 288.

Lepus baileyi Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XI, p. 148, June 9, 1897.

=Sylvilagus baileyi (Merriam). See Lyon, Smithsonian Miscell. Coll., XLV, No. 1456, p. 336, June 15, 1904.

56016. Skin and skull. Adult female. Spring Creek, Bighorn Basin, Wyoming. September 17, 1893. Collected by Dr. C. Hart Merriam and V. Bailey. Original number 4372.

Well-made skin, in good condition; skull lacking right zygoma and left audital bulla; right mandibular ramus broken.

Lepus floridanus caniclunis Miller.

Proc. Acad. Nat. Sci. Phila., 1899, p. 388, October 5, 1899.

=**Sylvilagus floridanus chapmani** (Allen).

63137. Skin and skull. Adult male. Fort Clark, Kinney County, Texas. December 27, 1892. Collected by Dr. E. A. Mearns, U. S. A. Original number 2172. International Boundary Commission. Catalogued January 25, 1896.

Well-made skin in good condition; skull nearly perfect; left bulla and left last upper molar missing, a small piece out of the left ascending mandibular ramus.

Sylvilagus auduboni cedrophilus Nelson. Biological Survey coll.

Proc. Biol. Soc. Wash., XX, p. 83, July 22, 1907.

148287. Skin and skull. Adult female. Cactus Flat, 20 miles north of Cliff, New Mexico. November 6, 1906. Collected by V. Bailey. Original number 8595.

Well-made skin in good condition; skull perfect, except for two perforations in vault of cranium.

Lepus floridanus chiapensis Nelson. Biological Survey collection.

Proc. Biol. Soc. Wash., XVII, pp. 106–107, May 18, 1904.

=**Sylvilagus floridanus chiapensis** (Nelson).

75953. Skin and skull. Adult female. San Cristobal, Chiapas, Mexico. September 28, 1895. Collected by E. W. Nelson and E. A. Goldman. Original number 8483.

Well-made skin in good condition; skull perfect.

Sylvilagus cognatus Nelson. Biological Survey collection.

Proc. Biol. Soc. Wash., XX, p. 82, July 22, 1907.

136569. Skin and skull. Adult. Tajique, near summit of Manzano Mountains, New Mexico. Altitude 10,000 feet. February, 1905. Collected by A. Rea. Original number 5331x.

Well-made skin in good condition; skull perfect.

Lepus floridanus connectens Nelson. Biological Survey collection.

Proc. Biol. Soc. Wash., XVII, pp. 105–106, May 18, 1904.

=**Sylvilagus floridanus connectens** (Nelson).

63660. Skin and skull. Adult male. Chichicaxtle, Vera Cruz, Mexico. February 15, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 5849.

Well-made skin in good condition; skull perfect.

Sylvilagus bachmani exiguus Nelson. Biological Survey collection.

Proc. Biol. Soc. Wash., XX, p. 84, July 22, 1907.

139607. Skin and skull. Adult male. Yubay, 30 miles southeast of Calamahue, Lower California, Mexico. September 19, 1905.

Collected by E. W. Nelson and E. A. Goldman. Original number 18153.

Well-made skin in good condition; skull perfect, except for broken angle of right mandibular ramus.

Lepus brasiliensis gabbi Allen. Cotypes.

Monographs North American Rodentia, p. 349, August, 1877.

=**Sylvilagus gabbi** (Allen). See Lyon, Smithsonian Miscell. Coll., XLV, No. 1456, p. 336, June 15, 1904.

$\frac{11371}{37794}$. Skin and skull. Adult male. Talamanca, Costa Rica. Late in 1872 or early in 1873. Received from Prof. W. M. Gabb. Collected by J. C. Zeledon. Original number 18. Skin catalogued 1873; skull, October 20, 1899.

Specimen has been made over into a modern study skin, in good condition and state of preservation. The skull is perfect, except for some chips out of the ascending ramus of the left half of the mandible.

11372. Skin with skull inside; all data as above except original number, which is 19. Catalogued 1873.

As Dr. J. A. Allen states, this specimen is quite immature and on the whole is a wretched-looking object. It has never been made up into a modern study skin.

Dr. Allen based this species on three specimens, all designated by number on page 350, Monographs North American Rodentia. One of them, 8140, comes from Chiriqui, and the other two numbers, 11371 and 11372, from Talamanca, Costa Rica. No type or cotypes were designated. In order to avoid two type localities for a single species, the two specimens from Talamanca are considered as cotypes and the Chiriqui specimen as a paratype. This course seems perfectly justifiable, as two-thirds of the specimens upon which the description was based came from Talamanca, and the species is named in honor of the collector or, rather, donor, and both of the Talamanca specimens came from Prof. Gabb, while the Chiriqui specimen was collected by Fred Hicks.

Lepus arizonæ goldmani Nelson. Biological Survey collection.

Proc. Biol. Soc. Wash., XVII, pp. 107-108, May 28, 1904.

=**Sylvilagus arizonæ goldmani** (Nelson).

96812. Skin and skull. Adult female (not male, as in original description). Culiacan, Sinaloa, Mexico. March 20, 1899. Collected by E. A. Goldman. Original number 13588.

Well-made skin in good condition; skull perfect.

Lepus graysoni Allen.

Monographs of North American Rodentia, p. 347, August, 1877.

=**Sylvilagus graysoni** (Allen). See Lyon, Smithsonian Miscell. Coll., XLV, No. 1456, p. 336, June 15, 1904.

8318. Skin, with skull inside. Adult female. Tres Marias Islands, Mexico, probably Maria Madre Island (see Nelson, North Amer. Fauna, No. 14, p. 16, April 29, 1899). Collected during "Explora-

tions in N. W. Mexico, Col. A. J. Grayson." **Original number** 135. Catalogued November 15, 1865.

Wretched skin, in poor condition, with a skull inside.

Type not explicitly designated by number, but by **comparing Dr. Allen's** remarks on page 347 with the table on page 348 it is seen that 8318 is the type. The specimen is also labeled "*Lepus Graysoni* type" in Dr. Allen's **hand**writing.

Lepus sylvaticus holzneri Mearns.

Proc. U. S. Nat. Mus., XVIII, No. 1081, p. 554, June 24, 1896.

=**Sylvilagus floridanus holzneri** (Mearns). See Lyon, Smithsonian Miscell. Coll., XLV, No. 1456, p. 336, June 15, 1904.

58937. Skin and skull. Adult female. In the Douglas Spruce zone, near the summit of the Huachuca Mountains, southern Arizona. August 29, 1893. Collected by Frank X. Holzner. **Original number** 989. International Boundary Commission. **Catalogued December** 16, 1893.

Well-made skin in good condition; skull perfect.

Lepus insonus Nelson. Biological Survey collection.

Proc. Biol. Soc. Wash., XVII, pp. 103–104, May 18, 1904.

=**Sylvilagus insonus** (Nelson).

126878. Skin and skull. Adult female. Omilteme, Guerrero, Mexico. May 20, 1903. Collected by E. W. Nelson and E. A. Goldman. Original number 16466.

Well-made skin in good condition, except for a small bare spot on the back; skull perfect.

Lepus arizonæ major Mearns.

Proc. U. S. Nat. Mus., XVIII, No. 1081, p. 557, June 24, 1896.

=**Sylvilagus arizonæ major** (Mearns). See Lyon, Smithsonian Miscell. Coll., XLV, No. 1456, p. 336, June 15, 1904.

$\frac{18192}{27090}$. Skin and skull. Adult male. Calabasas, Pima County, Arizona. October 23, 1889. Collected by Dr. L. Stejneger. **Original** number 3053. Catalogued January 30, 1890.

Well-made skin in good condition; skull perfect, except that right half of mandible has been broken vertically in two at middle of tooth row.

Sylvilagus mansuetus Nelson. Biological Survey collection.

Proc. Biol. Soc. Wash., XX, pp. 83–84, July 22, 1907.

79041. Skin and skull. Adult female (not male, as in original description). San Jose Island, Lower California, Mexico. **August 2**, 1895. Collected by J. E. McLellan. Original number 1444.

Well-made skin in good condition; skull perfect, except mandible, of which only the anterior part of left ramus, including teeth, is present.

Lepus margaritæ Miller.

Proc. Biol. Soc. Wash., XII, p. 97, April 30, 1898.

=**Sylvilagus margaritæ** (Miller). See Lyon, Smithsonian Miscell. Coll., XLV, No. 1456, p. 336, June 15, 1904.

63217. Skin and skull. Adult male. Margarita Island, Venezuela. July 1, 1895. Collected by Maj. Wirt Robinson, U. S. A. Original number 369. Catalogued March 25, 1896.

Well-made skin in good condition; skull perfect.

Lepus arizonæ minor Mearns.

Proc. U. S. Nat. Mus., XVIII, No. 1081, p. 557, June 24, 1896.

=**Sylvilagus arizonæ minor** (Mearns). See Lyon, Smithsonian Miscell. Coll., XLV, No. 1456, p. 336, June 15, 1904.

$\frac{20104}{37064}$. Skin and skull. Adult male. El Paso, Texas. February 6, 1892. Collected by Dr. E. A. Mearns, U. S. A., and F. X. Holzner. Original number 1418. International Boundary Commission. Skin catalogued April 28, 1892; skull, June 23, 1896.

Well-made skin in good condition; skull perfect, except for loss of last left lower molar and the left lower incisor broken off to the alveolus.

Sylvilagus auduboni neomexicanus Nelson. Biological Survey coll.

Proc. Biol. Soc. Wash., XX, p. 83, July 22, 1907.

118477. Skin and skull. Adult male. Fort Sumner, New Mexico. September 23, 1902. Collected by J. H. Gaut. Original number 506.

Well-made skin in good condition; skull perfect.

Lepus orizibæ Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., VIII, pp. 143–144, December 29, 1893.

=**Sylvilagus orizabæ** (Merriam). See Lyon, Smithsonian Miscell. Coll., XLV, No. 1456, p. 336, June 15, 1904.

53318. Skin and skull. Adult female. Mount Orizaba (altitude 9,500 feet), Puebla, Mexico. April 24, 1893. Collected by E. W. Nelson. Original number 4730.

Well-made skin in good condition; skull perfect, except for absence of posterior portions of both mandibular rami, including the last right lower molar.

Lepus veræcrucis pacificus Nelson. Biological Survey collection.

Proc. Biol. Soc. Wash., XVII, pp. 104–105, May 18, 1904.

=**Sylvilagus cunicularius pacificus** (Nelson).

70622. Skin and skull. Adult male. Acapulco, Guerrero, Mexico. January 9, 1895. Collected by E. W. Nelson and E. A. Goldman. Original number 7340.

Well-made skin in good condition; skull perfect, except for large shot perforation through the maxillaries beneath the base of the nasals and slight injury to right supraorbital border.

Sylvilagus floridanus restrictus Nelson. Biological Survey coll.

Proc. Biol. Soc. Wash., XX, p. 82, July 22, 1907.

$\frac{33687}{45722}$. Skin and skull. Adult male. Zapotlan, Jalisco, Mexico. April 25, 1892. Collected by E. W. Nelson. Original number 2576.

Well-made skin in good condition; skull perfect, except mandible, of which only three fragments, including all the teeth, are present.

Lepus sylvaticus rigidus Mearns.

Proc. U. S. Nat. Mus., XVIII, No. 1081, p. 555, footnote, June 24, 1896.

=**Sylvilagus floridanus rigidus** (Mearns). See Lyon, Smithsonian Miscell. Coll., XLV, No. 1456, p. 336, June 15, 1904.

$\frac{20336}{35657}$. Skin and skull. Adult male. Carrizalillo Mountains, near Monument No. 31, Mexican boundary line, Grant County, New Mexico. April 21, 1892. Collected by Dr. E. A. Mearns, U. S. A., and F. X. Holzner. Original number 1680. International Boundary Commission. Catalogued July 29, 1892.

Well-made skin in good condition; skull has right bulla and exoccipital missing and both zygomatic processes of the squamosals broken, last right upper molar missing; mandible considerably broken, the right half posteriorly and the left half anteriorly.

Lepus pinetis robustus Bailey. Biological Survey collection.

North Amer. Fauna, No. 25, pp. 159–160, October 24, 1905.

=**Sylvilagus pinetis robustus** (Bailey).

$\frac{18262}{25165}$. Skin and skull. Adult female. Davis Mountains, Texas. Altitude 6,000 feet. January 6, 1890. Collected by V. Bailey. Original number 873.

Well-made skin in good condition; skull perfect, except for absence of posterior portions of mandibular rami.

Lepus floridanus sanctidiegi Miller.

Proc. Acad. Nat. Sci. Phila., 1899, p. 389, October 5, 1899.

=**Sylvilagus floridanus sanctidiegi** (Miller). See Lyon, Smithsonian Miscell. Coll., XLV, No. 1456, p. 336, June 15, 1904.

60668. Skin and skull. Adult female. Monument number 258 (Pacific Ocean), Mexican boundary line, San Diego County, California. July 10, 1894. Collected by Dr. E. A. Mearns, U. S. A. Original number 3783. International Boundary Commission. Catalogued November 3, 1894.

Well-made skin in good condition; skull perfect, except that there is a chip out of right angular process.

Sylvilagus floridanus similis Nelson. Biological Survey collection.

Proc. Biol. Soc. Wash., XX, p. 82, July 22, 1907.

69517. Skin and skull. Adult male. Valentine, Nebraska. November 10, 1894. Collected by C. P. Streator. Original number 4442.

Well-made skin in good condition; skull perfect, except for absence of right supraorbital process; angles of mandible each with two perforations.

Lepus simplicicanus Miller.

Proc. Biol. Soc. Wash., XV, p. 81, April 25, 1902.

=**Sylvilagus floridanus chapmani** (Allen).

$\frac{21805}{36508}$. Skin and skull. Adult female. Brownsville, Texas. October 19, 1891. Collected by F. B. Armstrong. Purchased from C. K. Worthen. Original number 1402. Catalogued November 17, 1893.

Well-made skin in good condition; skull perfect, except for some slight injury about left angular process of mandible.

Lepus floridanus subcinctus Miller.

Proc. Acad. Nat. Sci. Phila., 1899, p. 386, October 5, 1899.

=**Sylvilagus floridanus subcinctus** (Miller). See Lyon, Smithsonian Miscell. Coll., XLV, No. 1456, p. 336, June 15, 1904.

$\frac{20435}{35665}$. Skin and skull. Adult female. Hacienda El Molino, near Negrete, Michoacan, Mexico. June 15, 1892. Collected by P. L. Jouy. Original number 415. Catalogued October 3, 1892.

Well-made skin in good condition; skull perfect.

Lepus trowbridgii Baird.

Proc. Acad. Nat. Sci. Phila., VII, p. 333, this paper was favorably reported for publication April 24, 1855.

=**Sylvilagus bachmani** (Waterhouse). See Lyon, Smithsonian Miscell. Coll., XLV, No. 1456, p. 336, June 15, 1904.

$\frac{310}{1235}$. Skull (skin lost). Monterey, California. 1853. Collected by Lieut. W. P. Trowbridge, U. S. A. Skin catalogued December 5, 1854; skull November 29, 1854. The entry in the skull catalogue reads, "Monterey? Cal. Perhaps San Diego."

Skull considerably damaged; posterior and inferior parts of brain-case wanting, and most of right side of skull posterior to rostrum broken away. Posterior part of right half of mandible also broken. One loose bulla is present. There should be a skin, No. 310, which can not now be found.

No type designated. By referring to Mammals of North America, pages 610–612, it is seen that most of the description is based upon No. 310; moreover, the measurements of 310 agree more nearly with those given in the original description. For these reasons No. $\frac{310}{1235}$ is here chosen as the type.

Lepus truei Allen.

Bull. Amer. Mus. Nat. Hist., III, p. 192, December 10, 1890.

=**Sylvilagus truei** (Allen). See Lyon, Smithsonian Miscell. Coll., XLV, No. 1456, p. 336, June 15, 1904.

$\frac{6357}{34878}$. Skin and skull. Adult. Mirador, Vera Cruz, Mexico. Collected by Dr. C. Sartorius. Original mark "e." Skin catalogued April, 1863; skull, November 27, 1890.

Skin in poor condition, laid out flat on side. A good deal of the epidermis has slipped from the feet. Skull formerly in the skin, and all the posterior parts are more or less damaged by the preservative used on the skin. The posterior parts of the brain-case and the posterior edges of the ascending rami of the mandible, especially of the right half, are lacking.

Type designated by number $\frac{6357}{25953}$. A large series of skulls in the Museum collection in the twenty-five thousands, was misnumbered and the skull of the present specimen, along with others, had to be renumbered, and is now 34878, instead of 25953.

Lepus bachmani ubericolor Miller.

Proc. Acad. Nat. Sci. Phila., 1899, p. 383, October 5, 1899.

=**Sylvilagus bachmani ubericolor** (Miller). See Lyon, Smithsonian Miscell. Coll., XLV, No. 1456, p. 337, June 15, 1904.

$\frac{19264}{36371}$. Skin and skull. Adult male. Beaverton, Oregon. February 25, 1890. Collected by A. W. Anthony. Original number 1226. Catalogued March 16, 1892.

Well-made skin in good condition; skull perfect, except for loss of right half of mandible.

Sylvilagus auduboni vallicola Nelson. Biological Survey collection.

Proc. Biol. Soc. Wash., XX, pp. 82–83, July 22, 1907.

$\frac{31257}{43122}$. Skin and skull. Adult female. San Emigdio Ranch, Kern County, California. October 22, 1891. Collected by E. W. Nelson. Original number 1353.

Well-made skin in good condition; skull perfect, except for absence of last two right and left upper molars.

Sylvilagus auduboni warreni Nelson. Biological Survey collection.

Proc. Biol. Soc. Wash., XX, p. 83, July 22, 1907.

148632. Skin and skull. Adult female. Coventry, Colorado. January 4, 1907. Collected by C. H. Smith. Original number 6312x.

Well-made skin in good condition; skull perfect, except mandible, which consists of three fragments, one including both incisors, another the left molar series, and the third the condyle and angular process.

Lepus floridanus yucatanicus Miller.

Proc. Acad. Nat. Sci. Phila., 1899, p. 384, October 5, 1899.

=**Sylvilagus floridanus yucatanicus** (Miller). See Lyon, Smithsonian Miscell. Coll., XLV. No. 1456, p. 337, June 15, 1904.

$\frac{11441}{37772}$. Skin and skull. Adult female. Merida, Yucatan, Mexico. February 22, 1865. Collected by Dr. A. Schott. Original number 207. Comision Cientifica de Yucatan, José Salazar Llarregui. Skin catalogued in 1873; skull, June 13, 1899.

Specimen recently made over into a modern study skin, well-preserved; skull quite complete, the tympanic, mastoid, and exoccipital bones of the right side broken away, and the angle of the right half of the mandible broken.

Genus BRACHYLAGUS.

Lepus idahoensis Merriam. Biological Survey collection.

North Amer. Fauna, No. 5, pp. 75–78, 2 figs., July 30, 1891.

=**Brachylagus idahoensis** (Merriam). See Lyon, Smithsonian Miscell. Coll., XLV, No. 1456, p. 337, June 15, 1904.

$\frac{24045}{31461}$. Skin and skull. Adult male. Pahsimeroi Valley, Custer County, Idaho. September 16, 1890. Collected by V. Bailey and Dr. B. H. Dutcher, U. S. A. Original number 1816.

Well-made skin in good condition; skull perfect, except for a perforation in each audital bulla.

Genus ROMEROLAGUS.

Romerolagus nelsoni Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., X, pp. 173–174, fig. 33, Dec. 29, 1896.

57949. Skin and skull. Adult male. Mount Popocatepetl, Mexico. January 6, 1894. Collected by E. W. Nelson and E. A. Goldman.

Well-made skin in good condition; skull perfect, except for absence of last left upper molar; angle of left mandibular ramus broken.

Family OCHOTONIDÆ.

Genus OCHOTONA.

Ochotona cansus Lyon.

Smithsonian Miscell. Coll., L, No. 1726, p. 136, pl. 15, figs. 1–3, July 9, 1907.

144030. Skin and skull. Adult male. Taocheo, Province of Kansu, China. June 8, 1906. Collected by W. W. Simpson. Original number 13. Catalogued March 6, 1907.

Well-made skin in good condition; skull perfect.

Lagomys collaris Nelson.

Proc. Biol. Soc. Wash., VIII, p. 117, December 21, 1893.

=**Ochotona collaris** (Nelson). See Trouessart, Catalogus Mammalium, p. 648, 1897.

$\frac{14384}{36297}$. Skin and skull. Adult. Near the head of the Tanana River, about 200 miles south of Fort Yukon, Alaska. Summer of 1880. Collected by E. W. Nelson. Original number 164. Skin catalogued June 11, 1884; skull, November 2, 1893.

Skin fairly well preserved, but badly made up; no wire in legs. Posterior and basal portions of the left half of the cranium and most of the ascending ramus of the left half of the mandible lacking; otherwise skull complete.

Family ERETHIZONTIDÆ.

Genus ERETHIZON.

Erethizon epixanthum couesi Mearns.

Proc. U. S. Nat. Mus., XIX, No. 1121, p. 723, July 30, 1897.

$\frac{1814}{1604}$. Skin and skull. Not quite adult. Fort Whipple, A Collected by Dr. Elliott Coues. Catalogued February 19,

Skin well preserved, but poorly made up; skull has lost both ma and the last upper and last lower molar of the right side: otherwise c

Erethizon epixanthum myops Merriam.

Proc. Wash. Acad. Sci., II, p. 27, March 14, 1900.

59140. Skin and skull. Old adult female. Portage Bay, September, 1893. Collected by C. H. Townsend, U. S. Bu Fisheries steamer *Albatross*. Catalogued January 30, 1894

Well-made skin in good condition, rather greasy; skull nearly perfe incisors broken off to the alveoli; lower jaw can not be found.

Family HYSTRICIDÆ.

Genus TRICHYS.

Trichys macrotis Miller.

Proc. U. S. Nat. Mus., XXVI, No. 1317, p. 469, February 3, 1903.

114488. Skin and skull. Adult female. Tapanuli Bay, north Sumatra. February 20, 1902. Collected by Dr. W. L. Original number 1555. Catalogued September 2, 1902.

Well-made skin in good condition; skull perfect.

Genus ATHERURUS.

Atherurus terutaus Lyon.

Proc. U. S. Nat. Mus., XXXII, No. 1552, p. 587, pls. 54–56, fig. 2, Jun

123971. Skin and skull. Adult male. Pulo Terutau (also Trotau and Trotto), about 15 geographic miles west of th Peninsula, where the 100th meridian east of Greenwich coast of the Malay Peninsula. April 12, 1904. Collectec W. L. Abbott. Original number 3223. Catalogued July

Well-made skin in good condition; skull perfect.

Atherura zygomatica Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 42, pl. 2, fig. 4, Novemb

=**Atherurus zygomaticus** Miller. See Lyon, Proc. U. S. Nat. Mus., X 1552, p. 587, June 29, 1907.

112429. Skin and skull. Adult female. Pulo Aor, off coast o June 6, 1901. Collected by Dr. W. L. Abbott. Origina 1009. Catalogued November 12, 1901.

Well-made skin in good condition; skull perfect.

Genus THECURUS.

Thecurus sumatræ Lyon.

Proc. U. S. Nat. Mus., XXXII, No. 1552, p. 583, pls. 54–56, fig. 1, and pl. 57; figs. 2, 9, 10, June 29, 1907.

143432. Skin and skull. Adult male. Aru Bay, east coast of Sumatra. January 17, 1906. Collected by Dr. W. L. Abbott. Original number 4637. Catalogued June 23, 1906.

Well-made skin in good condition; skull perfect.

Family OCTODONTIDÆ.

Genus CAPROMYS.

Capromys prehensilis gundlachi Chapman.

Bull. Amer. Mus. Nat. Hist., XIV, p. 317, pl. 39, November 12, 1901.

103905. Skin and skull. Adult male. Nueva Gerona, Isle of Pines, Cuba. July 4, 1900. Collected by William Palmer and J. H. Riley. Original number 505. Catalogued October 15, 1900.

Well-made skin in good condition; skull perfect.

Capromys brachyurus thoracatus True.

Proc. U. S. Nat. Mus., XI, p. 469, September 3, 1889.

=**Capromys thoracatus** (True). See Chapman, Bull. Amer. Mus. Nat. Hist., XXI, p. 321, November 12, 1901.

$\frac{15887}{22691}$. Skin and skull. Adult male. Little Swan Island, Caribbean Sea. March 6, 1887. Collected by C. H. Townsend. Catalogued June 26, 1887.

Skin well preserved, but not well made up; skull perfect.

Type not designated by number, but of the two original specimens Dr. True has personally selected the above as the type and placed a red label upon it.

Genus PROECHIMYS.

Proechimys guairæ Thomas.

Proc. Biol. Soc. Wash., XIV, p. 27, April 2, 1901.

102731. Skin and skull. Adult male. La Guaira, Venezuela. July 8, 1900. Collected by Major Wirt Robinson, U. S. A. and Dr. M. W. Lyon, jr. Original number 81. Catalogued September 19, 1900.

Fairly well-made skin in fair condition; skull perfect.

Genus CTENOMYS.

Ctenomys robustus Allen.

Bull. Amer. Mus. Nat. Hist., XIX, p. 185, May 9, 1903. Preoccupied by *Ctenomys robustus* Philippi (An. Mus. Nac. Chile, Zool. entr. 13, p. 11, 1896.)

=Ctenomys osgoodi Allen. Princeton Exped. Patagonia, III, Mamm., p. 191, 1905.

84149. Skin and skull. Adult male. Rio Chico de Santa Cruz, **near the Cordilleras, Patagonia.** February 20, 1897. Collected by **O. A.** Peterson. Original number 485. Catalogued March 15, 1898.

Well-made skin in good condition; skull perfect.

Type designated as No. 84194, an error for 84149. No. 84194 is a specimen of *C. sericeus*. The measurements of No. 84149 agree with those given by Dr. J. A. Allen as belonging to the type, and the specimen itself bears Dr. Allen's type label.

Ctenomys sericeus Allen.

Bull. Amer. Mus. Nat. Hist., XIX, p. 187, May 9, 1903.

84189. Skin and skull. Adult male, upper Rio Chico de Santa Cruz, Cordilleras, Patagonia. February 5, 1897. Collected by O. A. Peterson. Original number 331. Catalogued March 16, 1898.

Well-made skin in good condition; skull nearly perfect; last right upper molar lost; right external auditory meatus and posterior portion of left bulla slightly injured.

Type designated as No. 84191, which is an error for No. 84189. The measurements of the skin and skull ascribed by Dr. Allen to the type are those of 84189, and do not agree with those of 84191, a smaller individual. To indicate further that No. 84189 is the type, Dr. Allen has tied to the specimen the standard red type label of the *American* Museum *of Natural History*, with the italicized words crossed out and the words "U. S. Nat." added, as well as the name *Ctenomys sericeus* Allen.

Family ZAPODIDÆ.

Genus SICISTA.

Sminthus flavus True.

Proc. U. S. Nat. Mus., XVII, No. 1004, p. 341, November 15, 1894.

=**Sicista flava** (True). See Allen, Proc. Biol. Soc. Wash., XIV, p. 185, December 12, 1901.

$\frac{20140}{35603}$. Skin and skull. Adult male. Central Kashmir, at 11,000 feet. July 21, 1891. Collected by Dr. W. L. Abbott. Catalogued May 9, 1892.

Skin well preserved, but poorly made up; no wires in legs or tail; skull perfect, except for loss of angular process of left half of mandible and some slight damage to the right bulla.

Genus ZAPUS.

Zapus hudsonius alascensis Merriam. Biological Survey coll.

Proc. Biol. Soc. Wash., XI, p. 223, July 15, 1897.

73584. Skin and skull. Adult male. Yakutat, Alaska. July 5, 1895. Collected by C. P. Streator. Original number 4660.

Well-made skin in good condition; skull perfect.

Zapus hudsonius campestris Preble. Biological Survey collection.

North Amer. Fauna, No. 15, pp. 20–21, August 8, 1899.

65872. Skin and skull. Adult male. Bear Lodge Mountains, Wyoming. June 12, 1894. Collected by Dr. B. H. Dutcher, U. S. A. Original number 600.

Well-made skin in good condition; skull perfect.

Zapus major Preble. Biological Survey collection.

North Amer. Fauna, No. 15, pp. 24–25, August 8, 1899.

79983. Skin and skull. Adult female. Warner Mountains, Oregon. August 4, 1896. Collected by Dr. C. Hart Merriam and V. Bailey. Original number 5720.

Well-made skin in good condition; skull perfect, except for slight perforation in palate.

Zapus princeps minor Preble. Biological Survey collection.

North Amer. Fauna, No. 15, p. 23, August 8, 1899.

73673. Skin and skull. Adult female. Wingard, near Carlton House, Saskatchewan, Canada. July 23, 1895. Collected by J. A. Loring. Original number 3123.

Well-made skin in good condition; skull perfect.

Zapus trinotatus montanus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XI, p. 104, April 26, 1897.

=**Zapus montanus** (Merriam). See Preble, North Amer. Fauna, No. 15, p. 28, August 8, 1899.

79863. Skin and skull. Adult female. Crater Lake, Mount Mazama, Oregon. August 21, 1896 (not August 19, as in original description). Collected by E. A. Preble. Original number 1388.

Well-made skin in good condition; skull perfect.

Zapus nevadensis Preble. Biological Survey collection.

North Amer. Fauna, No. 15, pp. 25–26, August 8, 1899.

94185. Skin and skull. Adult female. Ruby Mountains, Nevada. June 21, 1898. Collected by V. Bailey. Original number 6581.

Well-made skin in good condition; skull perfect.

Zapus princeps oregonus Preble. Biological Survey collection.

North Amer. Fauna, No. 15, p. 24, August 8, 1899.

78156. Skin and skull. Adult male. Elgin, Blue Mountains, Oregon. May 29, 1896. Collected by E. A. Preble. Original number 959.

Well-made skin in good condition; skull perfect.

Zapus pacificus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XI, p. 104, April 26, 1897.

80445. Skin and skull. Young adult male. Prospect, Rogue River Valley, Oregon. August 29, 1896. Collected by E. A. Preble. Original number 1454.

Well-made skin in good condition; skull perfect.

Zapus (Napæozapus) insignis roanensis Preble. Biol. Survey coll.

North Amer. Fauna, No. 15, pp. 35–36, August 8, 1899.

66283. Skin and skull. Adult male. Magnetic City, base of Roan Mountain, North Carolina. May 22, 1894. Collected by A. G. Wetherby. Original number 5.

Well-made skin in good condition; skull perfect.

Zapus tenellus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XI, p. 103, April 26, 1897.

66932. Skin and skull. Adult female. Kamloops, British Columbia. August 25, 1894. Collected by C. P. Streator. Original number 4196.

Well-made skin in good condition; skull perfect, except for slight perforation of brain case.

Family HETEROMYIDÆ.

Genus HETEROMYS.

Heteromys annectens Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, p. 43, March 5, 1902.

71510. Skin and skull. Adult male. Pluma, Oaxaca, Mexico. March 18, 1895. Collected by E. W. Nelson and E. A. Goldman. Original number 7674.

Well-made skin in good condition; skull perfect, except for absence of entire right upper molariform series.

Heteromys goldmani Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, pp. 41–42, March 5, 1902.

77576. Skin and skull. Adult male. Chicharras, Chiapas, Mexico. February 7, 1896. Collected by E. W. Nelson and E. A. Goldman. Original number 9244.

Well-made skin in good condition; skull perfect.

Heteromys griseus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, p. 42, March 5, 1902.

76062. Skin and skull. Adult male. Mountains near Tonala, Chiapas, Mexico. August 15, 1895. Collected by E. W. Nelson and E. A. Goldman. Original number 8339.

Well-made skin in good condition; skull perfect.

Heteromys goldmani lepturus Merriam. Biological Survey coll.

Proc. Biol. Soc. Wash., XV, p. 42, March 5, 1902.

73382. Skin and skull. Adult male. Mountains near Santo Domingo, Oaxaca, Mexico. June 20, 1895. Collected by E. W. Nelson and E. A. Goldman. Original number 8120.

Well-made skin in good condition; skull perfect, except for absence of right zygoma and right upper molariform series.

Heteromys (Xylomys) nelsoni Merriam. Biological Survey coll.

Proc. Biol. Soc. Wash., XV, pp. 43–44, March 5, 1902.

77920. Skin and skull. Adult male. Pinabete, Chiapas, Mexico. February 11, 1896. Collected by E. W. Nelson and E. A. Goldman. Original number 9281.

Well-made skin in good condition; skull perfect.

Genus LIOMYS.

Liomys canus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, pp. 44–45, March 5, 1902.

96259. Skin and skull. Adult male. Parral, Chihuahua, Mexico. September 21, 1898. Collected by E. W. Nelson and E. A. Goldman. Original number 13036.

Well-made skin in good condition; skull perfect.

Liomys crispus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, p. 49, March 5, 1902.

75105. Skin and skull. Adult male. Tonala, Chiapas, Mexico. August 7, 1895. Collected by E. W. Nelson and E. A. Goldman. Original number 8283.

Well-made skin in good condition; skull perfect, except for absence of jugals.

Liomys heterothrix Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, p. 50, March 5, 1902.

90161. Skin and skull. Adult male. San Pedro Sula, Honduras. July 16, 1897. Collected by J. C. Ingersoll. Original number 884 x.

Well-made skin in good condition; skull perfect.

Liomys pictus isthmius Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, p. 46, March 5, 1902.

73367. Skin and skull. Adult male. Tehuantepec, Oaxaca, Mexico. April 28, 1895. Collected by E. W. Nelson and E. A. Goldman. Original number 7796.

Well-made skin in good condition; skull perfect.

Liomys torridus minor Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, p. 45, March 5, 1902.

70301. Skin and skull. Adult female. Huajuapam, Oaxaca, Mexico. November 18, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 7061.

Well-made skin in good condition; skull perfect.

Liomys obscurus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, p. 48, March 5, 1902.

108563. Skin and skull. Adult female. Carrizal, Vera Cruz, Mexico. May 12, 1901. Collected by E. W. Nelson and E. A. Goldman. Original number 14714.

Well-made skin in good condition; skull perfect.

Liomys orbitalis Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, pp. 48–49, March 5, 1902.

65452. Skin and skull. Adult female. Catemaco, Vera Cruz, Mexico. April 29, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 6129.

Well-made skin in good condition; skull perfect, except for absence of pterygoids and adjoining parts of palate.

Liomys parviceps Goldman. Biological Survey collection.

Proc. Biol. Soc. Wash., XVII, p. 82, March 21, 1904.

126477. Skin and skull. Adult female. La Salada, Michoacan, Mexico. March 19, 1903. Collected by E. W. Nelson and E. A. Goldman. Original number 16194.

Well-made skin in good condition; skull perfect.

Liomys phæura Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, p. 48, March 5, 1902.

71500. Skin and skull. Adult female. Pinotepa, Oaxaca, Mexico. February 21, 1895. Collected by E. W. Nelson and E. A. Goldman. Original number 7553.

Well-made skin in good condition; skull perfect, except for absence of last left lower molar.

Liomys plantinarensis Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, p. 46, March 5, 1902.

$\frac{33595}{46630}$. Skin and skull. Adult female. Plantinar, Jalisco, Mexico. April 4, 1892. Collected by E. W. Nelson and E. A. Goldman. Original number 2383.

Well-made skin in good condition; skull perfect, except for absence of right jugal.

Liomys pictus rostratus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, p. 46, March 5, 1902.

71488. Skin and skull. Adult male. Ometepec, Guerrero, Mexico. February 14, 1895. Collected by E. W. Nelson and E. A. Goldman. Original number 7447.

Well-made skin in good condition; skull perfect, except slightly broken nasals; five upper and three lower cheek teeth missing.

Liomys crispus setosus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, p. 49, March 5, 1902.

77588. Skin and skull. Adult female. Huehuetan, Chiapas, Mexico. February 22, 1896. Collected by E. W. Nelson and E. A. Goldman. Original number 9364.

Well-made skin in good condition; skull perfect, except for broken supraoccipital; last two lower molars on each side missing.

Liomys sonorana Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, p. 47, March 5, 1902.

96252. Skin and skull. Adult male. Alamos, Sonora, Mexico. December 19, 1898. Collected by E. A. Goldman. Original number 13299.

Well-made skin in good condition; skull perfect, except for absence of last upper molar on each side.

Liomys texensis Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, p. 44, March 5, 1902.

58670. Skin and skull. Adult female. Brownsville, Texas. February 19, 1894. Collected by J. A. Loring. Original number 1672.

Well-made skin in good condition; skull perfect.

Liomys torridus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, p. 45, March 5, 1902.

69645. Skin and skull. Adult female. Cuicatlan, Oaxaca, Mexico. October 14, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 6904.

Well-made skin in good condition; skull perfect.

Liomys veræcrucis Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, p. 47, March 5, 1902.

65457. Skin and skull. Adult female. San Andres Tuxtla, Vera Cruz, Mexico. May 7, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 6174.

Well-made skin in good condition; skull perfect.

Genus PEROGNATHUS.

Perognathus penicillatus ammophilus Osgood. **Biol. Survey coll.**

Proc. Biol. Soc. Wash., XX, pp. 20–21, February 23, 1907.

146859. Skin and skull. Adult male. Margarita Island, Lower California, Mexico. November 29, 1905. Collected by E. W. Nelson and E. A. Goldman. Original number 18655.

Well-made skin in good condition; skull perfect.

Perognathus amplus Osgood. Biological Survey collection.

North Amer. Fauna, No. 18, pp. 32–33, pl. 1, fig. 2, September 20, 1900.

$\frac{34626}{46711}$. Skin and skull. Adult male. Fort Verde, Yavapai County, Arizona. June 26, 1892. Collected by J. A. Loring. Original number 272.

Well-made skin in good condition; skull perfect.

Perognathus penicillatus angustirostris Osgood. **Biol. Survey coll.**

North Amer. Fauna, No. 18, p. 47, September 20, 1900.

73881. Skin and skull. Adult male. Carrizo Creek, Colorado Desert, California. March 31, 1895. Collected by A. W. Anthony. Original number 22.

Well-made skin in good condition; skull perfect.

Perognathus anthonyi Osgood. Biological Survey collection.

North Amer. Fauna, No. 18, pp. 56–57, September 20, 1900.

81058. Skin and skull. Adult female. South Bay, Cerros Island, Lower California, Mexico. July 29, 1896. Collected by A. W. Anthony. Original number 71.

Well-made skin in good condition; skull perfect, except for absence of right jugal.

Perognathus panamintinus arenicola Stephens. **Biol. Survey coll.**

Proc. Biol. Soc. Wash., XIII, p. 153, June 13, 1900.

99828. Skin and skull. Adult male. San Felipe Narrows, San Diego County, California. April 11, 1892. Collected by F. Stephens. Original number 2056 (2622x).

Well-made skin in good condition; skull perfect, except for absence of angular process of left mandibular ramus.

Perognathus artus Osgood. Biological Survey collection.

North Amer. Fauna, No. 18, p. 55, September 20, 1900.

96298. Skin and skull. Adult female. Batopilas, Chihuahua, Mexico. October 6, 1898. Collected by E. A. Goldman. Original number 13090.

Well-made skin in good condition; skull perfect.

Perognathus baileyi Merriam. Biological Survey collection.

Proc. Acad. Nat. Sci. Phila., 1894, pp. 262–263, fig. 1, September 27, 1894.

$\frac{17838}{24776}$. Skin and skull. Adult female. Magdalena, Sonora, Mexico. November 3, 1889. Collected by V. Bailey. Original number 633.

Well-made skin in good condition; skull perfect.

Perognathus bimaculatus Merriam.

North Amer. Fauna, No. 1, p. 12, October 25, 1889.

=**Perognathus flavus bimaculatus** (Merriam). See Osgood, North Amer. Fauna, No. 18, p. 24, September 20, 1900.

$\frac{8455}{23789}$. Skin and skull. Adult male. Fort Whipple, Yavapai County, Arizona. May 21, 1865. Collected by Dr. Elliott Coues. "Expls. in the Rocky Mts., No. 1499, Dr. Elliott Coues, U. S. A." Skin catalogued February 12, 1866; skull, July 3, 1889.

Fairly well-made skin in good condition. It was probably first made up with the skull inside, which has since been taken out. But little of the skull is present. Most of lower jaw, rostrum and upper incisors, each of the upper tooth rows in a separate piece, and parts of the parietals are present.

Perognathus bombycinus Osgood. Biological Survey collection.

Proc. Biol. Soc. Wash., XX, pp. 19–20, February 23, 1907.

136123. Skin and skull. Adult male. Yuma, Arizona. March 18, 1905. Collected by E. A. Goldman. Original number 16844.

Well-made skin in good condition; skull perfect, except for absence of right jugal and injury to right audital bulla.

Perognathus callistus Osgood. Biological Survey collection.

North Amer. Fauna, No. 18, p. 28, September 20, 1900.

88245. Skin and skull. Young adult male. Kinney Ranch, near Bitter Creek, Sweetwater County, Wyoming. May 14, 1897. Collected by J. A. Loring. Original number 4122.

Well-made skin in good condition; skull perfect.

Perognathus (Chætodipus) intermedius canescens Merriam. Biological Survey collection.

Proc. Acad. Nat. Sci. Phila., 1894, pp. 267–268, September 27, 1894.

=**Perognathus nelsoni canescens** (Merriam). See Osgood, North Amer. Fauna, No. 18, p. 54, September 20, 1900.

51016. Skin and skull. Young adult male. Jaral, Coahuila, Mexico. January 14, 1893. Collected by C. P. Streator. Original number 2557.

Well-made skin in good condition; skull perfect.

Perognathus columbianus Merriam. Biological Survey collection.

Proc. Acad. Nat. Sci. Phila., 1894, pp. 263–264, fig. 2, September 27, 1894.

=**Perognathus lordi columbianus** (Merriam). See Osgood, North Amer. Fauna, No. 18, p. 40, September 20, 1900.

$\frac{27361}{39450}$. Skin and skull. Young adult male. Pasco, Washington. May 9, 1891. Collected by C. P. Streator. Original number 768.

Well-made skin in good condition; skull perfect.

Perognathus californicus dispar Osgood. Biological Survey coll.

North Amer. Fauna, No. 18, pp. 58–59, September 20, 1900.

$\frac{32116}{45328}$. Skin and skull. Adult male. Carpenteria, Santa Barbara County, California. December 19, 1891. Collected by E. W. Nelson. Original number 1655.

Well-made skin in good condition; skull perfect.

Perognathus (Chætodipus) eremicus Mearns.

Bull. Amer. Mus. Nat. Hist., X, p. 300, August 31, 1898.

=**Perognathus penicillatus eremicus** (Mearns). See Osgood, North Amer. Fauna, No. 18, p. 48, September 20, 1900.

$\frac{21062}{36094}$. Skin and skull. Adult female. Fort Hancock, El Paso County, Texas. June 27, 1893. Collected by Dr. E. A. Mearns, U. S. A. Original number 2380. Catalogued July 29, 1893.

Well-made skin in good condition, but the tail has a break in both proximal and distal portions. Skull nearly perfect; a piece out of supraoccipital; right malar lacking.

Perognathus fallax Merriam.

North Amer. Fauna, No. 1, p. 19, October 25, 1889.

$\frac{15880}{22684}$. Skin and skull. Adult male. San Bernardino, California. "Reche Canyon, 3 miles southeast of Colton, San Bernardino County." (Osgood, North Amer. Fauna, No. 18, p. 55.) April 21, 1887. Collected by F. Stephens. Original number 424. Catalogued June 17, 1887.

Well-made skin in good condition; skull perfect.

Perognathus flavus Baird.

Proc. Acad. Nat. Sci. Phila., VII, p. 332, this paper was favorably reported for publication April 24, 1855.

$\frac{148}{1130}$. Fragment of skull (skin lost). El Paso, Texas. 1851. Collected by J. H. Clark. United States and Mexican Boundary Survey. Catalogued May 19, 1853.

The skull, No. 1130, is represented by the anterior part of the rostrum only. The skin can not be found.

Type not designated by number. Baird says, "Collected at El Paso by J. H. Clark." By referring to Mammals of North America, p. 425, it is seen that $\frac{148}{1130}$ is the specimen he must have had in mind, and is consequently the type.

Perognathus fuliginosus Merriam. Biological Survey collection.

North Amer. Fauna, No. 3, p. 74, September 4, 1890.

=**Perognathus flavus fuliginosus (Merriam).** See Osgood, North Amer. Fauna, No. 18, p. 25, September 20, 1900.

$\frac{17708}{24644}$. Skin and skull. Immature male. Cedar belt, northeast of San Francisco Mountain, Arizona. October 4, 1889. Collected by V. Bailey. Original number 559.

Well-made skin in good condition; skull nearly complete, but consisting of three separate sections; interparietal missing.

Perognathus merriami gilvus Osgood. Biological Survey coll.

North Amer. Fauna, No. 18, pp. 22–23, September 20, 1900.

$\frac{35939}{48273}$. Skin and skull. Adult male. Eddy (=Carlsbad), New Mexico. September 18, 1892. Collected by Dr. B. H. Dutcher, U. S. A. Original number 329.

Well-made skin with right hind leg missing; otherwise in good condition; skull perfect.

Perognathus goldmani Osgood. Biological Survey collection.

North Amer. Fauna, No. 18, pp. 54–55, September 20, 1900.

96673. Skin and skull. Adult female. Sinaloa, Sinaloa, Mexico. February 15, 1899. Collected by E. A. Goldman. Original number 13428.

Well-made skin in good condition; skull perfect.

Perognathus hispidus Baird.

Mammals of North America, p. 421, 1857.

$\frac{577}{1686}$. Skin and skull. Adult female. Charco Escondido, Tamaulipas, Mexico. 1853. Collected by Lieut. D. N. Couch, U. S. A. Catalogued March 15, 1855.

Badly-made skin with bare patches on the right flank and on the back. Tail never skinned out and tip gone. Skull in bad condition. All the upper teeth lacking; pterygoid region broken, both zygomata lacking; a large hole in the middle of the cranium. Lower jaw almost perfect. This skull apparently consists of sections of two different specimens glued together. (See Osgood, North Amer. Fauna, No. 18, p. 43, September 20, 1900.)

No type designated, but the description is clearly based upon No. 577.

Perognathus inornatus Merriam.

North Amer. Fauna, No. 1, p. 15, October 25, 1889.

=**Perognathus longimembris (Coues).** See Osgood, North Amer. Fauna, No. 18, p. 33, September 20, 1900.

$\frac{13394}{23790}$. In alcohol, with skull removed. Young adult male. Fresno, California. Collected by Gustav Eisen. Alcoholic catalogued February 6, 1882; skull, July 3, 1889.

Specimen generally well preserved, but the color looks changed; some hair has slipped from the left side. Exoccipitals of skull missing and the right bulla damaged; right half of mandible practically perfect; left half broken in two pieces.

Otognosis longimembris Coues.

Proc. Acad. Nat. Sci. Phila., 1875, p. 305, August 31, 1876.

=**Perognathus longimembris** (Coues). See Merriam, North Amer. Fauna, No. 1, p. 13, October 25, 1889.

$\frac{9856}{37356}$. In alcohol, with skull removed. Female. Fort Tejon, Cañada de las Uvas, Kern County, California. Collected by John Xantus. Alcoholic catalogued January, 1872; skull, April 4, 1898.

Alcoholic in poor condition; it has the appearance of having been completely dried at one time. The skull lacks the right malar. There is a large hole in the right audital bulla and a small one in the left bulla; otherwise it is perfect.

The specimen upon which Coues's provisional *O. longimembris* is based is designated by number.

Perognathus spinatus magdalenæ Osgood. Biological Survey coll.

Proc. Biol. Soc. Wash., XX, p. 21, February 23, 1907.

146102. Skin and skull. Adult female. Magdalena Island, Lower California, Mexico. November 25, 1905. Collected by E. W. Nelson and E. A. Goldman. Original number 18633.

Well-made skin in good condition; skull perfect, except for broken zygomata.

Perognathus parvus magruderensis Osgood. Biol. Survey coll.

North Amer. Fauna, No. 18, p. 38, September 20, 1900.

$\frac{28427}{40637}$. Skin and skull. Adult male. Mount Magruder, Nevada. June 6, 1891. Collected by V. Bailey. Original number 2899

Well-made skin in good condition; skull perfect.

Perognathus apache melanotis Osgood. Biological Survey coll.

North Amer. Fauna, No. 18, p. 27, September 20, 1900.

97416. Skin and skull. Adult female. Casas Grandes, Chihuahua, Mexico. May 21, 1899. Collected by E. A. Goldman. Original number 13750.

Well-made skin in good condition; skull perfect except for slight perforation in right audital bulla.

Perognathus flavus mexicanus Merriam. Biological Survey coll.

Proc. Acad. Nat. Sci. Phila., 1894, pp. 265–266, fig. 5, September 27, 1894.

50714. Skin and skull. Young adult male. Tlalpam, Federal District, Mexico. December 4, 1892. Collected by E. W. Nelson. Original number 3978.

Well-made skin in good condition; skull perfect.

Perognathus monticola Baird.

Mammals of North America, p. 422, 1857.

=**Perognathus parvus** (Peale). See Osgood, North Amer. Fauna, No. 18, p. 34, September 20, 1900.

$\frac{451}{1585}$. Mounted skin and skull. Adult female. "W. of Rocky Mts." (Mus. Cat.) 1853. Collected by Dr. George Suckley. Catalogued January 31, 1855. In regard to the locality, the following is quoted from Osgood, *op. cit.*, p. 36: "It is also not improbable that the type of Baird's '*monticola*' was also taken at The Dalles [Oregon]. Baird's queried statement that it came from St. Mary's Mission, Mont., is rendered much more doubtful by the unsuccessful efforts of recent collectors to obtain additional specimens from that locality. Dr. Suckley, who collected this type, stopped for some time at The Dalles and may have obtained it there."

The skin is badly mounted and in poor condition. It is much bleached and the ears are more or less broken, and on the posterior parts of body are two large areas without hair. The skull is in better condition, but upper incisors are broken off to the alveoli; the posterior parts of the zygomata, left audital bulla, and parts about the foramen magnum are broken; lower jaw almost perfect.

Baird had but one specimen, designated by number.

Perognathus (Chætodipus) nelsoni Merriam. Biological Survey coll.

Proc. Acad. Nat. Sci. Phila., 1894, p. 266, fig. 6, September 27, 1894.

50214. Skin and skull. Old female. Hacienda La Parada, San Luis Potosi, Mexico. August 19, 1892. Collected by E. W. Nelson. Original number 3207.

Well-made skin in good condition; skull perfect.

Perognathus nevadensis Merriam. Biological Survey collection.

Proc. Acad. Nat. Sci. Phila., 1894, p. 264, fig. 3, September 27, 1894.

54828. Skin and skull. Adult male. Halleck, Nevada. July 4, 1893. Collected by V. Bailey. Original number 4070.

Well-made skin in good condition; skull perfect.

Perognathus californicus ochrus Osgood. Biological Survey coll.

Proc. Biol. Soc. Wash., XVII, p. 128, June 9, 1904.

130348. Skin and skull. Young adult female. Santiago Springs, 16 miles southwest of McKittrick, Kern County, California. July 30, 1903. Collected by L. J. Goldman. Original number 728.

Well-made skin in good condition; skull perfect, except for broken zygomata.

Perognathus pacificus Mearns.

Bull. Amer. Mus. Nat. Hist., X, p. 299, August 31, 1898.

61022. Skin and skull. Adult female. Edge of Pacific Ocean, at the last Mexican boundary monument, No. 258, San Diego County, California. July 12, 1894. Collected by Dr. E. A. Mearns, U. S. A. Original number 3787. International Boundary Commission. Catalogued November 17, 1894.

Well-made skin in good condition; skull perfect.

Perognathus fallax pallidus Mearns.

Proc. Biol. Soc. Wash., XIV, p. 135, August 9, 1901.

61007. Skin and skull. Adult female. Mountain Spring, halfway up the east slope of the Coast Range Mountains near the Mexican boundary line, in San Diego County, California. May 16, 1894. Collected by Dr. E. A. Mearns, U. S. A. Original number 3520. International Boundary Commission. Catalogued November 17, 1894.

Well-made skin in good condition; skull perfect, except angular processes of mandible slightly chipped.

Perognathus longimembris panamintinus Merriam.

Biological Survey collection.

Proc. Acad. Nat. Sci. Phila., 1894, p. 265, fig. 4, September 27, 1894.

=**Perognathus panamintinus** (Merriam). See Osgood, North Amer. Fauna, No. 18, p. 28, September 20, 1900.

$\frac{27767}{39866}$. Skin and skull. Young adult male. Perognathus Flat, Emigrant Gap, Panamint Mountains, California. April 16, 1891. Collected by V. Bailey. Original number 2675.

Well-made skin in good condition; skull perfect.

Cricetodipus parvus Peale. See page 289.

Perognathus penecillatus Woodhouse.

Proc. Acad. Nat. Sci. Phila., VI, p. 200. Presented at meeting of December 28, 1852.

=**Perognathus penicillatus** Woodhouse. See Woodhouse, Rep. Exped. Zuni and Colorado Rivers, by Capt. L. Sitgreaves, p. 49, pl. 3, 1853.

$\frac{2676}{37437}$. Skin and skull. Adult male. San Francisco Mountain, Arizona. (Probably a few miles to the northeast. See Osgood, North Amer. Fauna, No. 18, p. 45, footnote, September 20, 1900.) 1851. Collected by Dr. S. W. Woodhouse on an expedition in command of Capt. L. Sitgreaves, U. S. A. Skin catalogued April 10, 1857; skull, June 4, 1898.

Skin formerly mounted, fairly well made up, but badly preserved. The hair looks worn and bleached and there are a couple of bare spots on the specimen. The tail has never been skinned out. Skull in fair condition; both zygomata are injured, especially the left, and there are more or less extensive openings in the orbital walls. Lower jaw perfect, except some chipping from the angular processes.

Type not designated by number. The original description speaks of a single specimen, a male, from San Francisco Mountain, and by referring to Baird's Mammals of North America, p. 419, No. 2676 is seen to be this specimen. It should be observed that the measurements given by Baird do not agree well with those given by Dr. Woodhouse.

Perognathus flavescens perniger Osgood. Biological Survey coll.

Proc. Biol. Soc. Wash., XVII, pp. 127–128, June 9, 1904.

57725. Skin and skull. Young female. Vermilion, South Dakota. August 22, 1889. Collected by G. S. Agersborg.

Skin in fair condition; abdominal incision not sewed up; skull perfect, except for broken zygomata.

Perognathus pernix rostratus Osgood. Biological Survey collection.

North Amer. Fauna, No. 18, p. 51, pl. 1, fig. 8, September 20, 1900.

95818. Skin and skull. Young adult male. Camoa, Rio Mayo, Sonora, Mexico. October 28, 1898. Collected by E. A. Goldman. Original number 13167.

Well-made skin in good condition; skull perfect.

Perognathus penicillatus siccus Osgood. Biological Survey coll.

Proc. Biol. Soc. Wash., XX, p. 20, February 23, 1907.

146890. Skin and skull. Adult male. Ceralbo Island, Lower California, Mexico. February 13, 1906. Collected by E. W. Nelson and E. A. Goldman. Original number 19131.

Well-made skin in good condition; skull perfect.

Perognathus (Chætodipus) stephensi Merriam. Biol. Survey coll.

Proc. Acad. Nat. Sci. Phila., 1894, p. 267, fig. 7, September 27, 1894.

$\frac{27774}{39873}$. Skin and skull. Adult male. Mesquite Valley, northwest arm of Death Valley, California. April 6, 1891. Collected by F. Stephens. Original number 258.

Well-made skin in good condition; skull perfect.

Perognathus hispidus zacatecæ Osgood. Biological Survey coll.

North Amer. Fauna, No. 18, p. 45, September 20, 1900.

91877. Skin and skull. Young adult female. Valparaiso, Zacatecas, Mexico. December 16, 1897. Collected by E. A. Goldman. Original number 11968.

Well-made skin in good condition; skull perfect.

Genus MICRODIPODOPS.

Microdipodops californicus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XIV, p. 128, July 19, 1901.

101227. Skin and skull. Young adult male. Sierra Valley, near Vinton, Plumas County, California. August 7, 1900. Collected by Dr. W. K. Fisher. Original number 1596.

Well-made skin in good condition; skull perfect, except for slight injury to lower lip of foramen magnum.

Microdipodops megacephalus Merriam. Biological Survey coll.

North Amer. Fauna, No. 5, pp. 116–117, July 30, 1891.

$\frac{24417}{31823}$. Skin and skull. Adult male. Halleck, Elko County, **Nevada.** October 23, 1890. Collected by V. Bailey. **Original number 2005.**

Well-made skin in good condition; skull perfect except for a few perforations in right mastoid bulla and broken left zygoma.

Microdipodops megacephalus oregonus Merriam. Biol. Survey coll.

Proc. Biol. Soc. Wash., XIV, p. 127, July 19, 1901.

80128. Skin and skull. Young adult male. **Lake Alvord, Oregon.** August 18, 1896. Collected by C. P. Streator. **Original number** 5430.

Well-made skin in good condition; skull perfect.

Microdipodops pallidus Merriam. Biological Survey **collection.**

Proc. Biol. Soc. Wash., XIV, pp. 127–128, July 19, 1901.

93520. Skin and skull. Adult female. Ten miles **east of Stillwater,** Nevada. May 11, 1898. Collected by **H. C. Oberholser. Original number** 101.

Well-made skin in good condition; skull perfect.

Genus DIPODÓMYS.

Dipodomys ambiguus Merriam. Biological Survey **collection.**

North. Amer. Fauna, No. 4, pp. 42–45, October 8, 1890.

=**Dipodomys merriami ambiguus** (Merriam). See Merriam, **Science, new ser.,** VII, p. 31, January 7, 1898.

$\frac{18147}{25045}$. Skin and skull. Adult male. El Paso, Texas. **December 13,** 1889. Collected by V. Bailey. Original number 782.

Well-made skin in good condition; skull perfect.

Dipodomys merriami atronasus Merriam. Biological Survey coll.

Proc. Biol. Soc. Wash., IX, p. 113, June 21, 1894.

50276. Skin and skull. Adult male. Hacienda **La Parada, San Luis** Potosi, Mexico. August 20, 1892. Collected by **E. W. Nelson.** Original number 3229.

Well-made skin in good condition; skull lacking right audital **bulla, basi**occipital, and adjacent parts of brain case; zygomata broken.

Dipodomys californicus Merriam. Biological Survey **collection.**

North Amer. Fauna, No. 4, p. 49, October 8, 1890.

$\frac{16618}{23644}$. Skin and skull. Adult male. Ukiah, **California. May 4,** 1889. Collected by Dr. T. S. Palmer. Original number **46.**

Well-made skin in good condition; skull perfect.

Dipodomys compactus True.

Proc. U. S. Nat. Mus., XI, No. 559, p. 160, January 5, 1889.

$\frac{18665}{35227}$. Skin only (skull lost). Adult female. Padre Island, Texas. April 3, 1888. Purchased from C. K. Worthen. Catalogued August 13, 1891.

Skin rather carelessly made up. Some epidermis has slipped from about the nose. A sewed-up cut along the throat looks as if the specimen had been made up with a skull inside and that the latter had afterwards been removed. This skull can not be found at present.

Type not designated. The description was based upon one specimen only. The data, including three measurements of the above specimen, agree in every respect with those given in the original description.

Dipodomys spectabilis cratodon Merriam. Biological Survey coll.

Proc. Biol. Soc. Wash., XX, p. 75, July 22, 1907.

78953. Skin and skull. Adult male. Chicalote, Aguas Calientes, Mexico. July 2, 1896. Collected by E. W. Nelson and E. A. Goldman. Original number 9734.

Well-made skin in good condition; skull perfect.

Dipodomys deserti Stephens.

Amer. Nat., XXI, p. 42, pl. 5, January, 1887.

$\frac{15629}{22622}$. Skin and skull. Adult female. Mohave River, California. June 29, 1886. Collected by F. Stephens. Original number 314. Catalogued December 29, 1886.

Well-made skin in good condition; skull perfect.

Type designated by the original number.

Dipodomys elator Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., IX, pp. 109–110, June 21, 1894.

64802. Skin and skull. Adult male. Henrietta, Texas. April 13, 1894. Collected by J. A. Loring. Original number 1804.

Well-made skin in good condition; skull perfect.

Dipodomys merriami exilis Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., IX, p. 113, June 21, 1894.

$\frac{34843}{43823}$. Skin and skull. Young adult male. Fresno, California. September 23, 1891. Collected by V. Bailey. Original number 3277.

Well-made skin in good condition; skull perfect.

Dipodomys insularis Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XX, p. 77, July 22, 1907.

79053. Skin and skull. Adult female. San Jose Island, Lower California, Mexico. August 6, 1895. Collected by J. E. McLellan. Original number 1457.

Well-made skin in good condition; skull perfect, except broken tips of nasals.

Dipodomys merriami kernensis Merriam. Biological Survey coll.

Proc. Biol. Soc. Wash., XX, pp. 77–78, July 22, 1907.

108884. Skin and skull. Adult male. Onyx, west end of Walker Pass, Kern County, California. July 25, 1901. Collected by Dr. W. K. Fisher. Original number 2106.

Well-made skin in good condition, except for a small bare spot in middle of back; skull perfect.

Dipodomys margaritæ Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XX, pp. 76–77, July 22, 1907.

146058. Skin and skull. Young adult male. Margarita Island, Lower California, Mexico. December 1, 1905. Collected by E. W. Nelson and E. A. Goldman. Original number 18711.

Well-made skin in good condition; skull perfect.

Dipodomys mitchelli Mearns.

Proc. U. S. Nat. Mus., XIX, No. 1121, p. 719, July 30, 1897.

63188. Skin and skull. Adult female. Tiburon Island, Gulf of California. December 23, 1895. Collected by J. W. Mitchell. Original number 3. Catalogued March 16, 1896.

Well-made skin in good condition; tail has never been skinned out, but is braced with wire. Skull lacks both malars; part of the left bulla is broken in two. Angular, coronoid, and condyloid processes of mandible more or less broken.

Dipodomys nelsoni Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XX, pp. 75–76, July 22, 1907.

79439. Skin and skull. Adult male. La Ventura, Coahuila, Mexico. August 10, 1896. Collected by E. W. Nelson and E. A. Goldman. Original number 9998.

Well-made skin in good condition; skull perfect.

Dipodomys merriami nevadensis Merriam. Biological Survey coll.

Proc. Biol. Soc. Wash., IX, pp. 111–112, June 21, 1894.

54552. Skin and skull. Adult female. Pyramid Lake, Nevada. June 26, 1893. Collected by V. Bailey. Original number 3990.

Well-made skin in good condition; skull perfect.

Dipodomys merriami nitratoides Merriam. Biological Survey coll.

Proc. Biol. Soc. Wash., IX, pp. 112–113, June 21, 1894.

54674. Skin and skull. Adult male. Tipton, Tulare County, California. June 25, 1893. Collected by C. P. Streator. Original number 2978.

Well-made skin in good condition; skull perfect, except for absence of last two upper molars and broken right mastoid bulla.

Dipodomys merriami nitratus Merriam. Biological Survey coll.

Proc. Biol. Soc. Wash., IX, p. 112, June 21, 1894.

$\frac{26358}{32772}$. Skin and skull. Adult male. Keeler, Inyo County, California. December 29, 1890. Collected by E. W. Nelson. Original number 160.

Well-made skin in good condition; skull perfect.

Dipodomys ornatus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., IX, pp. 110–111, June 21, 1894.

57990. Skin and skull. Adult female. Berriozabal, Zacatecas, Mexico. December 29, 1893. Collected by E. A. Goldman. Original number 5613.

Well-made skin in good condition; skull perfect, except for fractures of mastoid bullæ and left audital bulla and absence of last left lower molar.

Dipodomys perotensis Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., IX, p. 111, June 21, 1894.

54285. Skin and skull. Adult female. Perote, Vera Cruz, Mexico. May 21, 1893. Collected by E. W. Nelson. Original number 4840.

Well-made skin in good condition; skull with right zygoma and lachrymal shelf missing; right mastoid bulla and left audital bulla slightly broken.

Dipodomys platycephalus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XX, p. 76, July 22, 1907.

139882. Skin and skull. Adult male. Calmalli, Lower California, Mexico. October 1, 1905. Collected by E. W. Nelson and E. A. Goldman. Original number 18248.

Well-made skin in good condition; skull perfect, except for broken angular processes of mandible.

Dipodomys spectabilis Merriam. Biological Survey collection.

North Amer. Fauna, No. 4, pp. 46–48, October 8, 1890.

$\frac{17886}{24823}$. Skin and skull. Adult male. Dos Cabezos, Cochise County, Arizona. November 22, 1889. Collected by V. Bailey. Original number 695.

Well-made skin in good condition; skull perfect.

Genus PERODIPUS.

Perodipus cabezonæ Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XVII, pp. 144–145, July 14, 1904.

54055. Skin and skull. Adult female. Cabezon, Colorado Desert, California. May 31, 1893. Collected by C. P. Streator. Original number 2859.

Well-made skin in good condition; skull perfect, except for slight perforation of right audital bulla.

Perodipus ordi columbianus Merriam. **Biological Survey collection.**

Proc. Biol. Soc. Wash., p. 115, June 21, 1894.

$\frac{24181}{31594}$. Skin and skull. Adult female. Umatilla, Oregon. October 18, 1890. Collected by C. P. Streator. Original number 386.

Well-made skin in good condition; skull perfect.

Perodipus goldmani Merriam. **Biological Survey collection.**

Proc. Biol. Soc. Wash., XVII, p. 143, July 14, 1904.

118924. Skin and skull. Adult male. Salinas, Monterey County, California. September 4, 1902. Collected by L. J. Goldman. Original number 431.

Well-made skin in good condition; skull perfect, except for broken right audital bulla.

Perodipus ingens Merriam. **Biological Survey collection.**

Proc. Biol. Soc. Wash., XVII, pp. 141–142, July 14, 1904.

128805. Skin and skull. Adult male. Painted Rock, 20 miles southeast of Simmler, Carrizo Plain, San Luis Obispo County, California. August 6, 1903. Collected by L. J. Goldman. Original number 777.

Well-made skin in good condition; skull perfect.

Perodipus microps levipes Merriam. **Biological Survey collection.**

Proc. Biol. Soc. Wash., XVII, p. 145, July 14, 1904.

$\frac{27176}{34575}$. Skin and skull. Adult male. Perognathus Flat, Emigrant Gap, Panamint Mountains, California. April 16, 1891. Collected by V. Bailey. Original number 2668.

Well-made skin in good condition; skull perfect.

Dipodops longipes Merriam **Biological Survey collection.**

North Amer. Fauna, No. 3, pp. 71–73, September 4, 1890.

= **Perodipus longipes** (Merriam). See Allen, Abstract Proc. Linn. Soc. N. Y., 1893–94, p. 29, July 20, 1894.

$\frac{17793}{24639}$. Skin and skull. Young adult male. Echo Cliffs, Painted Desert, Arizona. September 22, 1889. Collected by Dr. C. Hart Merriam. Original number 512.

Well-made skin in good condition; skull perfect, except for absence of basioccipital and supraoccipital; mastoid bullæ fractured.

Perodipus microps Merriam. **Biological Survey collection.**

Proc. Biol. Soc. Wash., XVII, p. 145, July 14, 1904.

$\frac{25288}{32701}$. Skin and skull. Adult male. Lone Pine, Owens Valley, Inyo County, California. December 22, 1890. Collected by E. W. Nelson. Original number 138.

Well-made skin in good condition; skull perfect, except for slight break in right mastoid bulla.

Dipodomys montanus Baird.

Proc. Acad. Nat. Sci. Phila., VII, p. 334, this paper reported favorably for publication, April 24, 1855.

= Perodipus montanus (Baird). See Merriam, Proc. Biol. Soc. Wash., XVII, pp. 140-141, July 14, 1904.

$\frac{490}{1631}$. Skin and skull. Collected on Pacific Railroad Survey, near 38° lat., under Lieut. E. G. Beckwith, U. S. A., by Mr. Kreutzfeld in 1853. It was taken in the Rio Grande Valley, near Fort Massachusetts, then in New Mexico, at lat. 37° 32′, long. 105° 23′, now near the present town of Garland, Costilla County, Colorado. Catalogued February 16, 1855.

Skin badly made up, but well-preserved; skull with most of the posterior portions of the brain-case broken away; angular processes of mandible chipped.

Type not designated by number in the original description, but in Baird's Mammals of North America, page 412, a footnote speaks of No. 490 as the type.

Perodipus morroensis Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XX, pp. 78-79, July 22, 1907.

$\frac{31626}{43499}$. Skin and skull. Adult female. Morro, San Luis Obispo County, California. November 11, 1891. Collected by E. W. Nelson. Original number 1464.

Well-made skin in good condition; skull perfect.

Perodipus panamintinus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., IX, p. 114, June 21, 1894.

$\frac{28566}{40670}$. Skin and skull. Adult male. Head of Willow Creek, Panamint Mountains, California. May 12, 1891. Collected by E. W. Nelson. Original number 853.

Well-made skin in good condition; skull perfect.

Perodipus simulans peninsularis Merriam. Biological Survey coll.

Proc. Biol. Soc. Wash., XX, p. 79, July 22, 1907.

139872. Skin and skull. Young adult male. Santo Domingo, Lower California, Mexico. September 27, 1905. Collected by E. W. Nelson and E. A. Goldman. Original number 18215.

Well-made skin in good condition; skull perfect, except for absence of lachrymals.

Perodipus perplexus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XX, p. 79, July 22, 1907.

$\frac{29261}{41328}$. Skin and skull. Adult male. Walker Basin, Kern County, California. July 15, 1891. Collected by V. Bailey. Original number 3053.

Well-made skin in good condition; skull perfect, except broken lower incisors and slight injuries to palate and basioccipital.

Perodipus streatori simulans Merriam. **Biological Survey coll.**

Proc. Biol. Soc. Wash., p. 144, July 14, 1904.

$\frac{33105}{46103}$. Skin and skull. Adult female. Dulzura, San Diego County, California. November 24, 1891. Collected by C. H. Marsh. Original number 255.

Well-made skin in good condition; skull perfect, except for broken right audital bulla and supraoccipital.

Perodipus streatori Merriam. **Biological Survey collection.**

Proc. Biol. Soc. Wash., IX, pp. 113–114, June 21, 1894.

64310. Skin and skull. Adult female. Carbondale, Amador County, California. April 3, 1894. Collected by C. P. Streator. Original number 3673.

Well-made skin in good condition; skull perfect, except for slightly broken right mastoid bulla.

Perodipus agilis tularensis Merriam. **Biological Survey collection.**

Proc. Biol. Soc. Wash., XVII, p. 143, July 14, 1904.

127158. Skin and skull. Adult female. Alila, Tulare County, California. June 23, 1903. Collected by L. J. Goldman. Original number 563.

Well-made skin in good condition; skull perfect, except for absence of lachrymals.

Perodipus montanus utahensis Merriam. **Biological Survey coll.**

Proc. Biol. Soc. Wash., XVII, pp. 143–144, July 14, 1904.

55115. Skin and skull. Adult male. Ogden, Utah. July 15, 1893. Collected by V. Bailey. Original number 4085.

Well-made skin in good condition; skull perfect.

Perodipus venustus Merriam. **Biological Survey collection.**

Proc. Biol. Soc. Wash., XVII, p. 142, July 14, 1904.

51852. Skin and skull. Adult male. Santa Cruz, California. March 12, 1893. Collected by G. B. Badger. Original number 46.

Well-made skin in good condition; skull perfect, except for slightly injured palate and pterygoid, and absence of right lachrymal.

Family GEOMYIDÆ.

Genus THOMOMYS.

Thomomys talpoides agrestis Merriam. **Biological Survey collection.**

Proc. Biol. Soc. Wash., XXI, p. 144, June 9, 1908.

150725. Skin and skull. Adult female. Medano Ranch, San Luis Valley, Colorado. October 29, 1907. Collected by M. Cary. Original number 1205.

Well-made skin in good condition; skull perfect.

Thomomys alpinus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XI, p. 216, July 15, 1897.

$\frac{30528}{42512}$. Skin and skull. Adult male. Big Cottonwood Meadows, near Mount Whitney, California. Altitude 10,000 feet. August 6, 1891. Collected by Dr. B. H. Dutcher, U. S. A. Original number 167.

Well-made skin in good condition; skull perfect, except for a perforation in the supraoccipital.

Thomomys angularis Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XI, p. 214, July 15, 1897.

58123. Skin and skull. Adult male. Los Banos, Merced County, California. January 1, 1894. Collected by J. E. McLellan. Original number 418.

Well-made skin in good condition; skull perfect.

Thomomys alpinus awahnee Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XXI, pp. 146–147, June 9, 1908.

133076. Skin and skull. Adult female. Yosemite Valley, California. June 14, 1904. Collected by N. Hollister. Original number 870.

Well-made skin in good condition; skull perfect, except for absence of last left upper molar.

Thomomys baileyi Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XIV, p. 109, July 19, 1901.

$\frac{18256}{25159}$. Skin and skull. Adult female. Sierra Blanca, Texas. December 28, 1889. Collected by V. Bailey. Original number 870.

Well-made skin in good condition; skull perfect.

Thomomys bridgeri Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XIV, pp. 113–114, July 19, 1901.

$\frac{18858}{25592}$. Skin and skull. Adult male. Fort Bridger, Wyoming. May 27, 1890. Collected by V. Bailey. Original number 1207.

Well-made skin in good condition; skull perfect.

Thomomys cabezonæ Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XIV, p. 110, July 19, 1901.

53987. Skin and skull. Adult male. Cabezon, San Gorgonio Pass, California. June 3, 1893. Collected by C. P. Streator. Original number 2906.

Well-made skin in good condition; skull perfect.

Thomomys clusius Coues.

Proc. Acad. Nat. Sci. Phila., 1875, p. 138, June 15, 1875.

$\frac{3051}{36805}$. Skin and skull. Adult female. Bridger Pass, Sweetwater County, Wyoming. July 28, 1857. Collected by Dr. W. A. Ham-

mond, U. S. A. Original number 88. "Wagon Road to Bridger's Pass, Rocky Mountain," Lieut. F. T. Bryan, U. S. A. Skin catalogued October 6, 1857; skull, January 5, 1894.

Well-made skin in good condition. It has evidently been recently made over and the skull removed, probably in 1894. The skull has the posterior and basal portions of the cranium broken away; the left malar is missing and the upper incisors broken off to the alveoli. Both coronoid processes of mandible and the left angular process broken.

Thomomys fuscus fisheri Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XIV, pp. 111–112, July 19, 1901.

101238. Skin and skull. Young adult male. Beckwith, Sierra Valley, Plumas County, California. August 3, 1900. Collected by Dr. W. K. Fisher. Original number 1547.

Well-made skin in good condition; skull perfect, except for absence of left jugal.

Geomys fulvus Woodhouse.

Proc. Acad. Nat. Sci. Phila., VI, p. 201. Presented at meeting of December 28, 1852.

=**Thomomys fulvus** (Woodhouse). See Baird, Mammals of North America, p. 402, 1857.

2674. Mounted skin with no skull. San Francisco Mountain, Arizona. 1851. Collected by Dr. S. W. Woodhouse on expedition under command of Capt. L. Sitgreaves, U. S. A. Catalogued May, 1857.

Specimen in good shape and condition, especially considering its age and the time when it was mounted. It is probably much faded.

Type not designated by number. Woodhouse speaks of but one specimen, giving close measurements, and reference to Baird's Mammals of North America shows the above specimen to be the basis of the description.

Thomomys clusius fuscus Merriam. Biological Survey collection.

North Amer. Fauna, No. 5, pp. 69–70, July 30, 1891.

$\frac{24267}{31671}$. Skin and skull. Adult female. Head of Big Lost River, Idaho. September 23, 1890. Collected by Dr. B. H. Dutcher, U. S. A. Original number 1847.

Well-made skin in good condition; skull perfect, except for badly broken zygomata.

Thomomys goldmani Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XIV, pp. 108–109, July 19, 1901.

58075. Skin and skull. Adult male. Mapimi, Durango, Mexico. December 15, 1893. Collected by E. A. Goldman. Original number 240.

Well-made skin in good condition; skull perfect.

Thomomys hesperus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XIV, p. 116, July 19, 1901.

69825. Skin and skull. Adult female. Tillamook, Oregon. November 9, 1894. Collected by J. E. McLellan. Original number 1189.

Well-made skin in good condition; skull perfect, except for absence of left upper premolar.

Thomomys idahoensis Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XIV, p. 114, July 19, 1901.

$\frac{23182}{30900}$. Skin and skull. Adult male. Birch Creek, Idaho. August 8, 1890. Collected by C. P. Streator. Original number 129.

Well-made skin in good condition; skull perfect.

Thomomys fulvus intermedius Mearns.

Proc. U. S. Nat. Mus., XIX, No. 1121, p. 719, July 30, 1897.

$\frac{21437}{36697}$. Skin and skull. Adult male. Aspen and spruce zone at the summit of the Huachuca Mountains, Arizona. Altitude 9,000 feet. September 6, 1893. Collected by F. X. Holzner. International Boundary Commission. Original number 1013. Catalogued November 2, 1893.

Well-made skin in good condition; skull lacking most of the left zygoma, otherwise perfect.

Thomomys aureus lachuguilla Bailey. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, p. 120, June 2, 1902.

110336. Skin and skull. Adult male. Foothills near El Paso, Texas. September 24, 1901. Collected by V. Bailey. Original number 7858.

Well-made skin in good condition; skull perfect.

Thomomys laticeps Baird.

Proc. Acad. Nat. Sci. Phila., VII, p. 335, this paper was reported favorably for publication April 24, 1855.

$\frac{513}{1648}$. Skin and skull. Humboldt Bay, California. Collected by Lieut. W. P. Trowbridge, U. S. A. Catalogued February 21, 1855.

Badly made skin in rather poor condition; legs sprawling, tail not skinned out. A naked patch on left side. It has the appearance of once having been in alcohol. Skull much damaged, but lower jaw almost perfect. Rostral and tooth-bearing portions above complete, but the teeth on right side are all broken off. Fragments of cranial bones present and adherent to dried-up brain.

Type not designated by number in the original description, but in Mammals of North America it is seen that Baird had but one specimen referred to by number.

is represented by a rug, well-m
fragments, trimmings from the sa
ch 29, 1902, the skin was owned b
C., while the small scraps of skin w
it was catalogued, May 4, 1896. On M
came into the possession of the Museum
ype was designated. Doctor Mearns
al description, namely, skin no. 63403,
0855. The description is based primarily
tioned rather incidentally at the end of the
ement: "It appears to be a larger animal than
sert Tract, and unless the specimens brought
al, its horns are heavier," etc., which seems to
ut a minor part of the description.

vus lewisii Peale. See page 288.

Odocoileus nelsoni Merriam.

Proc. Biol. Soc. Wash., XII, pp. 103–104, April

76201. Skin and skull. Two-year-old male. Mexico. October 1, 1895. Collected by Goldman. Original number 8524.

Well-made skin in good condition; skull perfec

Odocoileus columbianus scaphiotus Merriam.

Proc. Biol. Soc. Wash., XII, p. 101, April 30, 189

65162. Skin and skull. Adult male. Laguna California. April 24, 1894. Collected by J. nal number 797.

Well-made skin in good condition; skull perfect.

Odocoileus columbianus sitkensis Merriam.

Proc. Biol. Soc. Wash., XII, pp. 100–101, April 30, 189

74383. Skin and skull. Immature female. Sitka 8, 1895. Collected by C. P. Streator. Origin

Well-made skin in good condition; skull perfect excep palate and audital bullæ; left supraorbital border slightly tal process broken.

Dorcelaphus texanus Mearns.

Proc. Biol. Soc. Wash., XII, p. 23, January 27, 1898.
=Odocoileus texanus (Mearns). See Thompson, Forest October 8, 1898.

84794. Skin and skull. Adult male. Fort Clark, Texas. December 25, 1897. Collected by Dr U. S. A. Original number 4288. International mission. Catalogued August 22, 1898.

Skin in good condition; skull nearly perfect. Antler most of the right lower incisiform teeth broken off to th Type designated by the original number.

riam. Biological Survey collection.
XIV, p. 112, July 19, 1901.
Adult female. Conconully, east base Cas-
ngton. September 11, 1897. Collected by
l number 4650.
ndition; skull perfect.

am. Biological Survey collection.
p. 216, July 15, 1897.
Adult male. Farewell Bend, Des Chutes
4, 1896. Collected by E. A. Preble.

tion; skull perfect.

Merriam. Biological Survey collection.
112, July 19, 1901.
male. Red Bluff, California. Decem-
y C. P. Streator. Original number

on; skull perfect, except for absence of two

Biological Survey collection.
-110, July 19, 1901.
male. Parral, Chihuahua, Mexico.
by E. W. Nelson and E. A. Gold-

skull perfect.

Biological Survey collection.
uly 15, 1897.
dult male. Austin, Nevada. No-
V. Bailey. Original number 2097.
ull perfect.

Biological Survey collection.
y 19, 1901.
Seaton, Oregon. October 6,
n. Original number 1147.
skull perfect, except for broken basi-

Biological Survey collection.
, 1901.
Fort Bridger, Wyoming.
y. Original number 1194.
fect.

Thomomys latirostris Merriam. Biological Survey **collection.**

Proc. Biol. Soc. Wash., XIV, p. 107, July 19, 1901.

$\frac{18003}{24914}$. Skin and skull. Adult male. Little Colorado River, Painted Desert, Arizona. September 22, 1899. Collected by V. Bailey. Original number 504.

Well-made skin in good condition; skull perfect.

Thomomys leucodon Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XI, p. 215, July 15, 1897.

$\frac{32034}{43848}$. Skin and skull. Adult male. Grants Pass, Rogue River Valley, Oregon. December 17, 1891. Collected by C. P. Streator. Original number 1394.

Well-made skin in good condition; skull perfect.

Thomomys limosus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XIV, p. 116, July 19, 1901.

89724. Skin and skull. Adult male. White Salmon, gorge of the Columbia River, Washington. June 26, 1897. Collected by J. A. Loring. Original number 4382.

Well-made skin with hairs of underparts somewhat matted and soiled; tip of tail slightly injured; skull perfect.

Thomomys mazama Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XI, p. 214, July 15, 1897.

80502. Skin and skull. Adult male. Anna Creek, Crater Lake, Mount Mazama, Oregon. September 3, 1896. Collected by E. A. Preble. Original number 1485.

Well-made skin in good condition; skull perfect.

Thomomys melanops Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XIII, p. 21, January 31, 1899.

90630. Skin and skull. Adult female. Timber line at head of Soleduck River, Olympic Mountains, Washington. August 28, 1897. Collected by V. Bailey. Original number 6219.

Well-made skin in good condition; skull perfect.

Thomomys mewa Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XXI, p. 146, June 9, 1908.

133183. Skin and skull. Adult male. Raymond, Madera County, California. June 28, 1904. Collected by N. Hollister. Original number 908.

Well-made skin in good condition; skull perfect.

Thomomys myops Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XIV, p. 112, July 19, 1901.

91066. Skin and skull. Adult female. Conconully, east base Cascade Mountains, Washington. September 11, 1897. Collected by J. A. Loring. Original number 4650.

Well-made skin in good condition; skull perfect.

Thomomys nasicus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XI, p. 216, July 15, 1897.

79815. Skin and skull. Adult male. Farewell Bend, Des Chutes River, Oregon. August 4, 1896. Collected by E. A. Preble. Original number 1274.

Well-made skin in good condition; skull perfect.

Thomomys leucodon navus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XIV, p. 112, July 19, 1901.

57791. Skin and skull. Adult male. Red Bluff, California. December 26, 1893. Collected by C. P. Streator. Original number 3462.

Well-made skin in good condition; skull perfect, except for absence of two upper and one lower cheek teeth.

Thomomys nelsoni Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XIV, pp. 109–110, July 19, 1901.

96451. Skin and skull. Adult female. Parral, Chihuahua, Mexico. September 18, 1898. Collected by E. W. Nelson and E. A. Goldman. Original number 13035.

Well-made skin in good condition; skull perfect.

Thomomys nevadensis Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XI, p. 213, July 15, 1897.

$\frac{25001}{32413}$. Skin and skull. Young adult male. Austin, Nevada. November 11, 1890. Collected by V. Bailey. Original number 2097.

Well-made skin in good condition; skull perfect.

Thomomys niger Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XIV, p. 117, July 19, 1901.

69407. Skin and skull. Adult male. Seaton, Oregon. October 6, 1894. Collected by J. E. McLellan. Original number 1147.

Well-made skin in good condition; skull perfect, except for broken basioccipital and left audital bulla.

Thomomys clusius ocius Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XIV, p. 114, July 19, 1901.

$\frac{18852}{25586}$. Skin and skull. Adult male. Fort Bridger, Wyoming. May 24, 1890. Collected by V. Bailey. Original number 1194.

Well-made skin in good condition; skull perfect.

Thomomys operarius Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XI, pp. 215–216, July 15, 1897.

$\frac{25054}{32466}$. Skin and skull. Adult male. Keeler, Inyo County, California. November 29, 1890. Collected by E. W. Nelson. Original number 1.

Well-made skin in good condition; skull perfect, except for broken crown of last left lower molar.

Thomomys douglasi oregonus Merriam. Biological Survey coll.

Proc. Biol. Soc. Wash., XIV, p. 115, July 19, 1901.

56939. Skin and skull. Adult male. Oregon City, Oregon. October 24, 1893. Collected by C. P. Streator. Original number 3340.

Well-made skin in good condition; skull perfect.

Thomomys orizabæ Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., VIII, p. 145, December 29, 1893.

53616. Skin and skull. Adult female. Mount Orizaba, Puebla, Mexico. Altitude 9,500 feet. April 25, 1893. Collected by E. W. Nelson. Original number 4744.

Well-made skin in good condition; skull perfect.

Thomomys angularis pascalis Merriam. Biological Survey coll.

Proc. Biol. Soc. Wash., XIV, p. 111, July 19, 1901.

$\frac{32779}{44702}$. Skin and skull. Adult male. Fresno, California. March 4, 1892 (not May 4, 1892, as in original description). Collected by C. P. Streator. Original number 1634.

Well-made skin in good condition; skull perfect.

Thomomys perditus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XIV, p. 108, July 19, 1901.

$\frac{25605}{32908}$. Skin and skull. Adult male. Lampazos, Nuevo Leon, Mexico. January 22, 1891. Collected by C. P. Streator. Original number 512.

Well-made skin in good condition; skull perfect, except for broken right lower incisor.

Thomomys peregrinus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., VIII, p. 146, December 29, 1893.

50130. Skin and skull. Young adult female. Salazar, Mexico, Mexico. October 24, 1892 (not October 23, 1892, as in original description). Collected by E. W. Nelson. Original number 3668.

Well-made skin in good condition; skull perfect.

Thomomys aureus perpes Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XIV, p. 111, July 19, 1901.

$\frac{25091}{32503}$. Skin and skull. Adult male. Lone Pine, Owens Valley, California. December 23, 1890. Collected by E. W. Nelson. Original number 145.

Well-made skin in good condition; skull perfect.

Thomomys aureus pervagus Merriam. Biological Survey coll.

Proc. Biol. Soc. Wash., XIV, pp. 110–111, July 19, 1901.

58293. Skin and skull. Adult male. Espanola, New Mexico. January 4, 1894. Collected by J. A. Loring. Original number 1548.

Well-made skin in good condition; skull perfect.

Thomomys monticola pinetorum Merriam. Biological Survey coll.

North Amer. Fauna, No. 16, p. 97, October 28, 1899.

95152. Skin and skull. Adult male. Sisson, California. September 4, 1898. Collected by R. T. Fisher. Original number 173.

Well-made skin in good condition; skull perfect, except for absence of right jugal and injury to left audital bulla.

Thomomys pygmæus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XIV, p. 115, July 19, 1901.

55271. Skin and skull. Adult male. Montpelier Creek, Idaho. July 29, 1893. Collected by V. Bailey. Original number 4150.

Well-made skin in good condition; skull perfect.

Thomomys quadratus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XI, pp. 214–215, July 15, 1897.

57134. Skin and skull. Adult male. The Dalles, Oregon. November 2, 1893. Collected by C. P. Streator. Original number 3359.

Well-made skin in good condition; skull perfect.

Thomomys sinaloæ Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XIV, p. 108, July 19, 1901.

96745. Skin and skull. Adult male. Altata, Sinaloa, Mexico. March 28, 1899. Collected by E. A. Goldman. Original number 13607.

Well-made skin in good condition; skull perfect, except for absence of left upper molariform series.

Thomomys fulvus texensis Bailey. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, pp. 119–120, June 2, 1902.

$\frac{22511}{31408}$. Skin and skull. Adult male. Head of Limpia Creek, Davis Mountains, Texas. Altitude 5,500 feet. January 7, 1890. Collected by V. Bailey. Original number 876.

Well-made skin in good condition; skull perfect.

Thomomys uinta Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XIV, pp. 112–113, July 19, 1901.

$\frac{22501}{30051}$. Skin and skull. Adult male. Uinta Mountains, Utah. Altitude 10,000 feet. June 6, 1890. Collected by V. Bailey. Original number 1262.

Well-made skin in good condition; skull perfect.

Thomomys douglasi yelmensis Merriam. Biological Survey coll.

Proc. Biol. Soc. Wash., XIII, p. 21, January 31, 1899.

$\frac{31916}{43777}$. Skin and skull. Adult male. Tenino, Yelm Prairie, Washington. October 24, 1891. Collected by C. P. Streator. Original number 1385.

Well-made skin in good condition; skull perfect.

Genus GEOMYS.

Geomys arenarius Merriam. Biological Survey collection.

North Amer. Fauna, No. 8, pp. 113, 139–141, pl. 9, fig. 1; pl. 13, fig. 13, January 31, 1895.

$\frac{18117}{25016}$. Skin and skull. Adult male. El Paso, Texas. December 14, 1889 (not December 13, 1889, as in original description). Collected by V. Bailey. Original number 798.

Well-made skin in good condition; skull perfect.

Geomys breviceps attwateri Merriam. Biological Survey coll.

North Amer. Fauna, No. 8, pp. 113, 135–137, pl. 9, fig. 3, January 31, 1895.

51382. Skin and skull. Adult male. Rockport, Texas. November 18, 1892. Collected by H. H. Keays. Original number 36.

Well-made skin in good condition; skull perfect.

Geomys breviceps Baird.

Proc. Acad. Nat. Sci. Phila., VII, p. 335, reported favorably for publication April 24, 1855.

$\frac{156}{1138}$. Skin and skull. Adult female. Prairie Mer Rouge, Louisiana. 1852. Collected by James Fairie. Skin catalogued May 19, 1853; skull May 25, 1853.

Skin well preserved. It has somewhat the appearance of having been in alcohol at one time; rather badly made up. Skull has a large triangular opening in brain case on the right side, involving basal and posterior parts. Mandible with left coronoid process broken and the right and left last lower molars lost.

Type not designated by number, but close measurements are given in the original description, which apply to No. 156 only, in the tables given in Baird's Mammals of North America, pages 379 and 380.

Geomys personatus fallax Merriam. Biological Survey collection.

North Amer. Fauna, No. 8, pp. 113, 144–145, pl. 12, fig. 3, January 31, 1895.

$\frac{32031}{43845}$. Skin and skull. Adult male. South side of Nueces Bay, Texas. November 30, 1891. Collected by W. Lloyd. Original number 949.

Well-made skin in good condition; skull perfect.

Geomys breviceps llanensis Bailey. Biological Survey collection.

North Amer. Fauna, No. 25, pp. 129–130, October 24, 1905.

97086. Skin and skull. Adult male. Llano, Texas. May 15, 1899. Collected by V. Bailey. Original number 6912.

Well-made skin in good condition; skull perfect.

Geomys bursarius lutescens Merriam. Biological Survey collection.

North Amer. Fauna, No. 4, p. 51, October 8, 1890.

=**Geomys lutescens** (Merriam). See Merriam, North Amer. Fauna, No. 8, p. 127, January 31, 1895.

$\frac{16677}{23595}$. Skin and skull. Adult male (not female, as in original description). Sandhills near Birdwood Creek, Lincoln County, Nebraska. May 27, 1889. Collected by A. B. Baker. Original number 11.

Well-made skin in good condition; skull perfect, except for absence of one upper molar.

Geomys tuza mobilensis Merriam. Biological Survey collection.

North Amer. Fauna, No. 8, pp. 113, 119–120, numerous pls. and figs., January 31, 1895.

$\frac{33988}{46023}$. Skin and skull. Adult male. Mobile Bay, Alabama. April 26, 1892. Collected by R. J. Thompson. Original number 50.

Well-made skin in good condition; skull perfect, except for absence of right upper and lower molariform series and last left lower molar.

Geomys personatus True. Cotypes.

Proc. U. S. Nat. Mus., XI, No. 699, p. 159, January 5, 1889.

$\frac{19667}{37999}$. Skin and skull. Adult male.

$\frac{19668}{38000}$. Skin and skull. Adult female.

Padre Island, Cameron County, Texas. April 11, 1888. Purchased from C. K. Worthen. Skins catalogued August 13, 1891; skulls February 21, 1902.

No type designated. Description based equally upon the above two specimens indicated by numbers. Well-made skins in good condition. They originally had skulls inside, which were taken out in February, 1902. Skulls in poor condition; the lower jaws are fairly good, but the rest of each skull is represented by the rostrum and tooth-bearing parts only.

Geomys breviceps sagittalis Merriam. Biological Survey coll.

North Amer. Fauna, No. 8, pp. 113, 134–135, pl. 9, fig. 4, January 31, 1895.

$\frac{32936}{44957}$. Skin and skull. Adult male. Clear Creek, Galveston Bay, Texas. March 28, 1892. Collected by W. Lloyd. Original number 1181.

Well-made skin in good condition; skull perfect, except for absence of one upper molar.

Genus PAPPOGEOMYS.

Pappogeomys albinasus Merriam. Biological Survey collection.

North Amer. Fauna, No. 8, pp. 147, 149, January 31, 1895.

$\frac{34138}{46215}$. Skin and skull. Adult female. Atemajac, near Guadalajara, Jalisco, Mexico. May 21, 1892. Collected by E. W. Nelson. Original number 2654.

Well-made skin in good condition; skull perfect.

Geomys nelsoni Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., VII, pp. 164–165, September 29, 1892.

=**Pappogeomys bulleri** (Thomas). See Merriam, North Amer. Fauna, No. 8, p. 147, January 31, 1895.

$\frac{33587}{45622}$. Skin and skull. Old male. North slope Sierra Nevada de Colima, Jalisco, Mexico. April 11, 1892. Collected by E. W. Nelson. Original number 2436.

Well-made skin in good condition; skull perfect.

Genus CRATOGEOMYS.

Pseudostoma castanops Baird.

Report Stansbury's Expedition to Great Salt Lake, p. 313, June, 1852.

=**Cratogeomys castanops** (Baird). See Merriam, North Amer. Fauna, No. 8, p. 159, January 31, 1895.

$\frac{4007}{3861}$. Skin and skull. "Collected by Lieutenant Abert along the prairie road to Bent's Fort," near the present town of Las Animas, Bent County, Colorado, on the Arkansas River. Catalogued June 18, 1860.

The specimen formerly mounted has been made over into a modern study skin, but it is bleached and is otherwise in very poor condition. Lower jaw perfect. All the posterior part of the brain-case is missing, also the left zygoma. A large fissure is at base of rostrum, and both upper incisors are broken off at the roots.

Type not designated by number, but Baird, in the Mammals of North America, page 385, says there was but one specimen collected by Lieutenant Abert at the above locality.

Geomys clarkii Baird.

Proc. Acad. Nat. Sci. Phila., VII, p. 332, this paper was favorably reported for publication April 24, 1855.

=**Cratogeomys castanops** (Baird). See Merriam, North Amer. Fauna, No. 8, p. 159, January 31, 1895.

$\frac{6}{1621}$. Skin, skull, and parts of skeleton. Presidio del Norte, on the Rio Grande, Chihuahua, Mexico. Collected by J. H. Clark, United States and Mexican Boundary Survey, Maj. W. H. Emory, U. S. A., commissioner. Skin catalogued February 12, 1852; skull, February 15, 1855.

Skin was formerly mounted, but was made into a modern study skin August, 1898. It is not in first-class condition and appears much bleached. Skull is in better condition, but both nasals are gone; pterygoids are injured and the ascending parts of the right half of mandible are broken. Practically all of the skeleton is present, but some bones are in the feet of the skin.

Type not designated by number in the original description. By referring to Baird's Mammals of North America, page 381, it is seen but two specimens came from Presidio del Norte and one of them is a skull only, not mentioned in the first description. Moreover, the measurements of No. 6 are exactly those given in the original description.

Cratogeomys estor Merriam. Biological Survey collection.

North Amer. Fauna, No. 8, pp. 151, 155–156, pl. 8, figs. 4–5, January 31, 1895.

54308. Skin and skull. Adult male. Las Vigas, Vera Cruz, Mexico. June 12, 1893. Collected by E. W. Nelson. Original number 5005.

Well-made skin in good condition; skull perfect.

Cratogeomys fulvescens Merriam. Biological Survey collection.

North Amer. Fauna, No. 8, pp. 151, 161–162, pl. 12, fig. 2, January 31, 1895.

58168. Skin and skull. Adult male. Chalchicomula, Puebla, Mexico. January 15, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 5651.

Well-made skin in good condition; skull perfect.

Cratogeomys castanops goldmani Merriam. Biological Survey coll.

North Amer. Fauna, No. 8, pp. 151, 160–161, January 31, 1895.

57965. Skin and skull. Young adult female. Cañitas, Zacatecas, Mexico. December 24, 1893. Collected by E. A. Goldman. Original number 286.

Well-made skin in good condition; skull perfect.

Cratogeomys oreocetes Merriam. Biological Survey collection.

North Amer. Fauna, No. 8, pp. 151, 156–157, pl. 8, figs. 1–2, January 31, 1895.

57963. Skin and skull. Young adult female. Mount Popocatepetl, Mexico. January 7, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 5647.

Well-made skin in good condition; skull perfect, except for absence of left lower molar series.

Cratogeomys peregrinus Merriam. Biological Survey collection.

North Amer. Fauna, No. 8, pp. 151, 158–159, pl. 8, fig. 3, January 31, 1895.

57964. Skin and skull. Old female. Mount Iztaccihuatl, Mexico. January 9, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 5650.

Well-made skin in good condition; skull perfect, except for right lower molariform teeth, some of which are broken.

Cratogeomys perotensis Merriam. Biological Survey collection.

North Amer. Fauna, No. 8, pp. 151, 154–155, pl. 8, fig. 6, January 31, 1895.

54299. Skin and skull. Adult female. Cofre de Perote, Vera Cruz, Mexico. May 28, 1893. Collected by E. W. Nelson. Original number 4889.

Well-made skin in good condition; skull perfect, except for absence of crown of last left upper molar.

Genus PLATYGEOMYS.

Platygeomys tylorhinus angustirostris Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XVI, pp. 81–82, May 29, 1903.

125688. Skin and skull. Adult female. Patamban, Michoacan, Mexico. February 2, 1903. Collected by E. W. Nelson and E. A. Goldman. Original number 15850.

Well-made skin in good condition; skull perfect.

Geomys fumosus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., VII, pp. 165–166, September 29, 1892.

=Platygeomys fumosus (Merriam). See Merriam, North Amer. Fauna, No. 8, p. 170, January 31, 1895.

$\frac{33202}{45207}$. Skin and skull. Adult male. Colima, Colima, Mexico. March 27, 1892. Collected by E. W. Nelson. Original number 2338.

Well-made skin in good condition; skull perfect.

Geomys gymnurus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., VII, pp. 166–167, September 29, 1892.

=Platygeomys gymnurus (Merriam). See Merriam, North Amer. Fauna, No. 8, p. 164, January 31, 1895.

$\frac{33579}{45614}$. Skin and skull. Adult female. Zapotlan, Jalisco, Mexico. April 16, 1892. Collected by E. W. Nelson. Original number 2460.

Well-made skin in good condition; skull perfect.

Platygeomys neglectus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, pp. 68–69, March 22, 1902.

81218. Skin and skull. Adult male. Cerro de la Calentura, near Pinal de Amoles, Queretaro, Mexico. September 14, 1896 (not September 4, as in original description). Collected by E. A. Goldman. Original number 10142.

Well-made skin in good condition; skull perfect.

Platygeomys planiceps Merriam. Biological Survey collection.

North Amer. Fauna, No. 8, pp. 164, 168–170, pl. 13, fig. 3; pl. 14, fig. 9, January 31, 1895.

55906. Skin and skull. Adult male. North slope Volcan Toluca, Mexico. September 12, 1893. Collected by E. W. Nelson. Original number 5466.

Well-made skin in good condition; skull perfect except for absence of crown of left lower premolar, left coronoid process, and left condyle.

Platygeomys tylorhinus Merriam. Biological Survey collection.

North Amer. Fauna, No. 8, pp. 164, 167–168, pl. 13, fig. 1, January 31, 1895.

51883. Skin and skull. Adult male. Tula, Hidalgo, Mexico. March 13, 1893. Collected by E. W. Nelson. Original number 4442.

Well-made skin in good condition; skull perfect, except broken tips of coronoids.

Genus ORTHOGEOMYS.

Orthogeomys latifrons Merriam.

North Amer. Fauna, No. 8, p. 178, pl. 11, figs. 5 and 6, text fig. 64, January 31, 1895.

61239. Skin and skull. Adult. Probably from Guatemala. From World's Columbian Exposition (Chicago, 1893), Exhibit of Guatemala, No. 2. Catalogued November 19, 1894.

Well-made skin in good condition, except for a little shedding of epidermis about the ears. Facial portion of skull, except right zygoma, complete; posterior portion of brain-case cut away. Mandible with both coronoid processes broken, otherwise complete.

Type designated by the original number 2. Specimen evidently not entered in catalogue at time the description was written.

Orthogeomys nelsoni Merriam. Biological Survey collection.

North Amer. Fauna, No. 8, pp. 173, 176–178, fig. 63, January 31, 1895.

66751. Skin and skull. Adult male. Mount Zempoaltepec, Oaxaca, Mexico. July 8, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 6376.

Well-made skin in good condition; skull perfect.

Genus HETEROGEOMYS.

Heterogeomys torridus Merriam. Biological Survey collection.

North Amer. Fauna, No. 8, pp. 180, 183–185, numerous pls. and figs., January 31, 1895.

63629. Skin and skull. Adult female. Chichicaxtle, Vera Cruz, Mexico. February 15, 1894. Collected by E. W. Nelson. Original number 5850.

Well-made skin in good condition; skull perfect, except for absence of left upper premolar.

Genus MACROGEOMYS.

Macrogeomys costaricensis Merriam.

North Amer. Fauna, No. 8, p. 192, pl. 11, fig. 3; pl. 13, fig. 23; pl. 14, fig. 10, January 31, 1895.

$\frac{12911}{22551}$. Skin and skull. Young. Pacuare, Costa Rica. 1876. Collected by Juan Cooper. Original number 96. Skin catalogued June 23, 1878; skull, February 1, 1887.

Well-made skin in good condition; a little hair gone from the occiput; skull in good condition; except right upper incisor broken, also tips of nasals; pterygoids somewhat damaged.

Macrogeomys dolichocephalus Merriam.

North Amer. Fauna, No. 8, p. 189, pl. 5; pl. 10, fig. 7; pl. 13, fig. 19, January 31, 1895.

$\frac{8627}{36295}$. Skin and skull. Adult male. San José, Costa Rica. January, 1866. Collected by José C. Zeledon. Explorations in Costa Rica under Dr. A. Von Frantzius. Skin catalogued November 6, 1866; skull, October 31, 1893.

Skin not very well made up, but apparently in good condition; skull nearly perfect, somewhat damaged about pterygoids, and a quadrangular hole is in supraoccipital, running up from foramen magnum.

Genus ZYGOGEOMYS.

Zygogeomys trichopus Merriam. Biological Survey collection.

North Amer. Fauna, No. 8, pp. 196–198, pl. 6; pl. 13, fig. 24; pl. 14, fig. 1; pl. 15, fig. 10, January 31, 1895.

50107. Skin and skull. Adult male. Nahuatzin, Michoacan, Mexico. October 11, 1892. Collected by E. W. Nelson. Original number 3571.

Well-made skin in good condition; skull perfect.

Family MURIDÆ.

Genus DICROSTONYX.

Dicrostonyx unalascensis Merriam. Biological Survey Collection.

Proc. Wash. Acad. Sci., II, p. 25, March 14, 1900.

99622. Skull only. Adult. Unalaska, Alaska. July 8, 1899. Collected by Dr. C. Hart Merriam.

Nearly perfect skull from owl pellet.

Genus LEMMUS.

Lemmus minusculus Osgood. Biological Survey collection.

North Amer. Fauna, No. 24, pp. 36–37, November 23, 1904.

119612. Skin and skull. Adult male. Kakhtul River, near mouth of Malchatna River, Alaska. September 1, 1902. Collected by W. H. Osgood and A. G. Maddren. Original number 1903.

Well-made skin in good condition; skull perfect.

Myodes nigripes True.

Diagnoses of New North American Mammals, p. 2, April 26, 1894. (Reprinted in Proc. U. S. Nat. Mus., XVII, No. 999, p. 242, November 15, 1894.)

=**Lemmus nigripes** (True). See Miller, North Amer. Fauna, No. 12, p. 37, July 23, 1896.

59152. Skin and skull. Adult male. St. George Island, Alaska. August 18, 1892 (or 1893). Collected by C. H. Townsend, U. S. Bureau of Fisheries steamer *Albatross*. Catalogued February 5, 1894.

Well-made skin in good condition; skull with part of left zygoma and both coronoid processes of mandible absent; otherwise perfect.

Lemmus yukonensis Merriam. Biological Survey collection.

Proc. Wash. Acad. Sci., II, p. 27, March 14, 1900.

98849. Skin and skull. Young adult female. Charlie Creek, Yukon River, Alaska. August 9, 1899. Collected by W. H. Osgood. Original number 769.

Well-made skin in good condition; skull perfect.

Genus SYNAPTOMYS.

Synaptomys (Mictomys) bullatus Preble. Biological Survey coll.

Proc. Biol. Soc. Wash., XV, pp. 181–182, August 6, 1902.

110632. Skin and skull. Adult male. Trout Rock, 25 miles south of Fort Rae, Great Slave Lake, Mackenzie, Canada. July 17, 1901 (not August 17, 1901, as in original description). Collected by E. A. Preble. Original number 4511.

Well-made skin in good condition; skull perfect.

Synaptomys cooperi Baird.

Mammals of North America, p. 558, 1857.

$\frac{1367}{3230}$. Skin and skull. Received from William Cooper, of Hoboken, New Jersey. Skin catalogued February 26, 1856; skull, June, 1857. Locality unknown. Baird says, "No locality was assigned, but the animal is undoubtedly North American, probably from the New England States or New York; possibly from Iowa or Minnesota." Dr. C. H. Merriam (Proc. Biol. Soc. Wash., VII, 1892, p. 177) thinks it not unlikely that the specimen came from southern New York or northern New Jersey.

The specimen is little more than a ball of fur. Head, legs (except one foreleg detached), and tail are lacking. The skull is in better condition. With the exception of the left zygoma the facial parts are complete and perfect, and the frontal, parietal, and most of the squamosal of the right side are present. The left half of the mandible has the angular and coronoid processes broken away, while the right half has the condyloid broken off as well.

Type designated by number on page 556 of the original description.

Synaptomys (Mictomys) dalli Merriam.

Proc. Biol. Soc. Wash., X, p. 62, March 19, 1896.

49373. Skeleton made from alcoholic specimen No. 10957, no other trace of which can now be found. Adult male. Nulato, Alaska. February, 1867. Collected by Dr. W. H. Dall. Catalogued October 22, 1872; skeleton April 28, 1894.

All of the skeleton is present and in good condition; skull not quite perfect; right malar absent; a piece out of the supraoccipital and both coronoid processes of mandible more or less broken.

Synaptomys helaletes gossii Merriam.

Proc. Biol. Soc. Wash., X, p. 60, March 19, 1896.

6915. Skull. (No record of a skin.) Adult male. **Neosho Falls, Kansas.** 1866. Collected by B. F. Goss. Catalogued May 4, 1866.

Skull perfect, except incisors broken off nearly to the alveoli; both pterygoids broken, also tip of right coronoid process of mandible.

Synaptomys helaletes Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., X, p. 59, fig. 3, March 19, 1896.

75172. Skin and skull. Adult female. **Dismal Swamp, Virginia.** October 14, 1895. Collected by Dr. A. K. Fisher. Original number 1818.

Well-made skin in good condition; skull perfect.

Mictomys innuitus True.

Diagnoses of New North American Mammals, April 26, 1894, p. 3. (Reprinted in Proc. U. S. Nat. Mus., XVII, No. 999, p. 243, November 15, 1894.)

=**Synaptomys (Mictomys) innuitus** (True). See Merriam, Proc. Biol. Soc. Wash., X, p. 61, March 19, 1896.

$\frac{14838}{24729}$. In alcohol; skull removed. Adult female. **Fort Chimo, Ungava, Labrador.** Spring of 1886. Collected by L. M. Turner. Original number 506.

Specimen in good state of preservation, but unnecessarily opened up, in order to remove the skull; skull in good condition, except right pterygoid broken away, hole at the posterior lateral angle of the right parietal, and mandible with both angular processes broken away.

Synaptomys (Mictomys) sphagnicola Preble. Biol. Survey coll.

Proc. Biol. Soc. Wash., XIII, pp. 43–45, fig. 3*a*, May 29, 1899.

96543. Skin and skull. Adult male. **Fabyans, near base of Mount Washington, New Hampshire.** June 29, 1898. Collected by E. A. Preble. Original number 2402.

Well-made skin in good condition; skull perfect.

Synaptomys (Mictomys) truei Merriam.

Proc. Biol. Soc. Wash., X, p. 62, March 19, 1896.

$\frac{3798}{12101}$. Skin only; skull lost. Young adult. **Skagit Valley, Washington.** August 6, 1859. Collected by Dr. C. B. Kennerly. Original number 304. Northwestern Boundary Survey, A. Campbell, commander. Skin catalogued February 21, 1860; skull February, 1872.

Skin a mere flat pelt glued on a piece of cloth with the left hind leg (the only one present) tied to it. In the original description Dr. C. Hart Merriam says the skull was in fragments. These can not now be found.

Synaptomys (Mictomys) wrangeli Merriam. Biological Survey coll.

Proc. Biol. Soc. Wash., X, p. 63, fig. 5, March 19, 1896.

74720. Skin and skull. Adult male. Wrangel, Alaska. September 6, 1895. Collected by C. P. Streator. Original number 4871.

Well-made skin in good condition; skull perfect except for slight injury to end of nasals and an irregular perforation of the anterior part of brain case beneath the frontals.

Genus MICROTUS.

Microtus abbreviatus Miller.

Proc. Biol. Soc. Wash., XIII, p. 13, January 31, 1899.

$\frac{15540}{22429}$. Skin and skull. Young adult female. Hall Island, Bering Sea. September 8, 1885. Collected by C. H. Townsend. Catalogued September 10, 1886.

Considering its history, the skin is in good condition. It has been remade into a modern study skin. Mr. Miller (*loc. cit.*) says: "Mr. Townsend tells me that the specimen was preserved dry. It was received at the National Museum in September, 1886, and its subsequent history is not known. It was found in a bottle of alcohol in October, 1898." Skull not in such good condition as the skin; rather damaged, including the lower jaw, on the right-hand side and posteriorly.

Microtus acrophilus Miller.

Proc. Acad. Nat. Sci. Phila., 1899, p. 296, August 9, 1899.

62162. Skin and skull. Adult female. On the Ladak side of the Kara Korum Pass, altitude 17,000 feet, Kashmir. July 25, 1893. Collected by Dr. W. L. Abbott. Catalogued May 16, 1895.

Well-made skin and in good condition; skull has lost both malars, left pterygoid, and there is a hole in the left half of the basioccipital.

Microtus oregoni adocetus Merriam. Biological Survey Collection.

Proc. Biol. Soc. Wash., XXI, pp. 145–146, June 9, 1908.

137995. Skin and skull. Adult male. South Yallobally Mountain, California. July 30, 1905. Collected by A. S. Bunnell. Original number 135.

Well-made skin in good condition; skull perfect.

Arvicola albicauda True.

Proc. U. S. Nat. Mus., XVII, No. 976, p. 12, May 8, 1894.

=**Microtus albicauda** (True). See Miller, North Amer. Fauna, No. 12, p. 54, July 23, 1896.

$\frac{20393}{36816}$. Skin and skull. Adult female. Braldu Valley, Baltistan, Kashmir; altitude 11,000 feet. December 19, 1891. Collected by Dr. W. L. Abbott. Skin catalogued August 11, 1892; skull, March 7, 1894.

Well-made skin in good condition; skull with left malar missing, left bulla injured, and right coronoid process of mandible broken, otherwise perfect.

Neofiber alleni True.

Science, IV, p. 34, July 11, 1884.

=**Microtus alleni** (True). See Miller, North Amer. Fauna, No. 12, p. 9, July 23, 1896.

$\frac{14065}{21948}$. Skin, viscera in alcohol, and skeleton. Adult male. Georgiana, Brevard County, Florida. Collected by William Wittfeld. Received in Museum December 24, 1883. Catalogued January 17, 1884; skeleton June, 1885.

The whole specimen was originally in alcohol. It was then skinned, mounted, and placed on exhibition. The skeleton was prepared and the viscera put in alcohol. The mounted specimen has since been taken down and made into a study skin which is well made and in good condition except for a small naked spot on the right hip and the loss of many toenails. It is much lighter than normal, from exposure to light and probably from the effects of alcohol. The skeleton is in excellent condition and on exhibition in the Division of Comparative Anatomy. The viscera, both abdominal and thoracic, are well preserved.

Type not designated by number in the original description. The above specimen is said by Dr. F. W. True and F. A. Lucas to be the original specimen, which was unique at the time of describing.

Arvicola (Mynomes) alticolus Merriam. Biological Survey coll.

North Amer. Fauna, No. 3, pp. 67–69, pl. 5, figs. 1–2; pl. 6, figs. 1–4, September 4, 1890.

=**Microtus alticolus** (Merriam). See Allen, Bull. Amer. Mus. Nat. Hist., VII, p. 219, June 29, 1895.

$\frac{17615}{24551}$. Skin and skull. Adult female. Little Spring, San Francisco Mountain, Arizona. July 31, 1889. Collected by Dr. C. Hart Merriam and V. Bailey. Original number 243.

Well-made skin in good condition; skull perfect except for perforation in left auditul bulla and repaired fractures of frontals and parietals.

Microtus angusticeps Bailey. Biological Survey collection.

Proc. Biol. Soc. Wash., XII, p. 86, April 30, 1898.

$\frac{17087}{24068}$. Skin and skull. Adult male. Crescent City, California. June 16, 1889. Collected by Dr. T. S. Palmer. Original number 151.

Well-made skin in good condition; skull perfect.

Arvicola apella Le Conte.

Proc. Acad. Nat. Sci. Phila., VI, p. 405, this paper was favorably reported for publication October 25, 1853.

=**Microtus pinetorum scalopsoides** (Audubon and Bachman). See Batchelder, Proc. Bost. Soc. Nat. Hist., XXVII, p. 187, October, 1896.

4714. Skin with skull inside. Pennsylvania. One of Major J. E. Le Conte's collection. Catalogued April 13, 1861.

Skin poorly made up, but well preserved.

This specimen not designated by number as a type. The specimen bears two old labels each marked "apella," as well as one of Coues' labels calling it the type. In Monographs of North American Rodentia, pages 223 and 224, Coues refers to No. 4714 as the type of *Arvicola apella* Le Conte.

Microtus aphorodemus Preble. Biological Survey collection.

North Amer. Fauna, No. 22, pp. 52–53, October 31, 1902.

106422. Skin and skull. Adult female. West shore Hudson Bay, on barren grounds, about 50 miles south of Cape Eskimo, Keewatin, Canada. August 5, 1900. Collected by E. A. Preble. Original number 3208.

Well-made skin in good condition; skull perfect.

Microtus montanus arizonensis Bailey. Biological Survey coll.

Proc. Biol. Soc. Wash., XII, p. 88, April 30, 1898.

$\frac{24778}{32179}$. Skin and skull. Adult male. Springerville, Arizona. November 7, 1890. Collected by E. W. Nelson. Original number 153.

Well-made skin in good condition; skull perfect.

Microtus pinetorum auricularis Bailey. Biological Survey coll.

Proc. Biol. Soc. Wash., XII, p. 90, April 30, 1898.

$\frac{34062}{46139}$. Skin and skull. Adult male. Washington, Mississippi. May 26, 1892. Collected by V. Bailey. Original number 3649.

Well-made skin in good condition; skull perfect.

Arvicola austerus Le Conte.

Proc. Acad. Nat. Sci. Phila., VI, p. 405, this paper was favorably reported for publication October 25, 1853.

=**Microtus ochrogaster** (Wagner). See Allen, Bull. Amer. Mus. Nat. Hist., X, p. 459, November 10, 1898; Osgood, Proc. Biol. Soc. Wash., XX, p. 48, April 18, 1907.

2249. Skin (no record of a skull). Racine, Wisconsin. Collected by Dr. P. R. Hoy. Original number 950. Catalogued February 28, 1857.

Poorly made skin, right hind leg nearly detached, but specimen well preserved. Type not designated by number. The specimen bears one old label inscribed "*Arvicola austerus* Racine, Wisc." on the obverse, and on the reverse "Type of species." In the "Remarks" column in the old original catalogue is written "Type of Maj. Le Conte." On pages 210 and 214 of Monographs of North American Rodentia, Coues speaks of 2249 as the type of *Arvicola austerus*.

Microtus bairdi Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XI, pp. 74–75, April 21, 1897.

79906. Skin and skull. Adult female. Glacier Peak, Crater Lake, Oregon. August 24, 1896. Collected by Dr. C. Hart Merriam and V. Bailey. Original number 5813.

Well-made skin in good condition; skull with badly broken parietals and tips of nasals.

Microtus mordax bernardinus Merriam. Biological Survey coll.

Proc. Biol. Soc. Wash., XXI, p. 145, June 9, 1908.

150632. Skin and skull. Adult male. Dry Lake, San Bernardino Mountains, California; altitude 9,000 feet, at north base San Gorgonio Peak. August 21, 1907. Collected by V. Bailey. Original number 8749.

Well-made skin in good condition; skull perfect.

Microtus brachelix Miller.

Proc. Acad. Nat. Sci. Phila., 1899, p. 290, August 9, 1899.

63445. Skin and skull. Young adult female. Nagmarg, Kashmir; 9,000 feet. November 15, 1895. Collected by Dr. W. L. Abbott. Catalogued June 12, 1896.

Well-made skin in good condition; skull originally much broken, but glued together so that it is nearly perfect except about the pterygoids.

Arvicola breweri Baird. Cotypes.

Mammals of North America, p. 525, 1857.

=**Microtus breweri** (Baird). See Miller, Proc. Bost. Soc. Nat. Hist., XXVII, p. 83, June, 1896.

No particular specimen is designated by Baird as the type and there is nothing to show that any one of the six specimens given in his list should be taken as such. Consequently all six listed become cotypes. They were collected in July, 1856, on Muskeget Island, Massachusetts, by Dr. T. M. Brewer. Catalogued May 31, 1857. The specimens are as follows:

2828. Adult male in alcohol; in good condition.

2829. Adult male in alcohol; can not be found.

$\frac{2830}{3213}$. Adult female. Skin and skull.

Skin poorly made, but well preserved, except for two spots devoid of hair on side. Skull quite perfect, except pterygoids; right half of mandible lost.

$\frac{2831}{3214}$. Adult male. Skin and skull.

Skin poorly made, but well preserved. Skull lacks the right tympanic, periotic, and mastoid bones and the right half of mandible.

$\frac{2832}{3220}$. Immature male. Skin and skull.

Skin can not now be found. Skull present. Both malars and posterior half of brain case missing. Two extra molars present, perhaps belonging to the missing lower jaws of the two preceding.

2833. Specimen in alcohol; can not now be found.

Arvicola californica Peale.

U. S. Exploring Expedition, Mammalia and Ornithology, p. 46, 1848.

=**Microtus californicus** (Peale). See Trouessart, Catalogus Mammalium, p. 563, 1897.

$\frac{10082}{4156}$. Skin and skull. Vicinity of San Francisco Bay, California. Collected by T. R. Peale. U. S. Exploring Expedition from 1838 to 1842. Skin catalogued 1872; skull, 1860.

Skin poorly made up; tail not skinned out. It looks rather discolored. The catalogue entry says "Dry," but the specimen looks as if it had been in alcohol at one time. An old parchment label further bears out this view. Skull injured about the pterygoids; both bullæ, especially the left, and the right zygoma somewhat injured. The ascending parts of left half of mandible broken away.

Type not designated by number. In the entry of the skin in 1872 (twelve years after entry of the skull[a]) under the remarks column of the catalogue is written in the handwriting of the original entry "type of californicus." The old parchment label on the specimen is marked "*Arvicola Californica* Peale." One of Dr. Coues's labels is attached, marked "Monograph of American Muridae. Dr. Elliott Coues, U. S. A., No. 10082. Type of *Arvicola 'californica.'*" On page 534 of Mammals of North America, Baird speaks of having the original specimen. In the table on page 173, Monographs of North American Rodentia, Dr. Coues has 10082 marked as the type of "*californicus*."

Microtus nanus canescens Bailey. Biological Survey collection.

Proc. Biol. Soc. Wash., XII, pp. 87–88, April 30, 1898.

90577. Skin and skull. Adult male. Conconully, Washington. September 12, 1897. Collected by J. A. Loring. Original number 4654.

Well-made skin in good condition; skull lacking entire rostral portion except one loose upper incisor; right audital bulla injured; anterior wall of brain case perforated; ends of lower incisors broken off.

Microtus canicaudus Miller. Biological Survey collection.

Proc. Biol. Soc. Wash., XI, pp. 67–68, April 21, 1897.

75841. Skin and skull. Adult male. McCoy, Oregon. December 1, 1895. Collected by B. J. Bretherton. Original number 219.

Well-made skin in good condition; skull perfect, except for absence of left coronoid process.

Arvicola (Pedomys) cinnamomea Baird.

Mammals of North America, p. 541, pl. 54, [Specimen No. 1714] (teeth), 1857.

=Microtus ochrogaster (Wagner). See Osgood, Proc. Biol. Soc. Wash., XX, p. 48, April 18, 1907.

$\frac{591}{1714}$. Skin (lost) and skull. Adult male. Pembina, North Dakota. Collected by C. Cavileer. Original number 23. Catalogued March 19, 1855.

The skin, number 591, according to a note in the catalogue, was misplaced before 1890 and has not been found since. Skull in fair condition; pterygoids broken, both malars lacking, and pieces broken off the processes of the mandible.

Baird had but one specimen, the above, designated by number.

Bailey, North American Fauna No. 17, page 74, says, "Except for a slightly abnormal tooth pattern, Baird's type of *cinnamomea* is a large specimen of typical *austerus*. I can not believe that it ever came from Pembina."

[a] Bailey (North Amer. Fauna, No. 17, p. 35) thinks the skull is abnormal or never came from the same animal as the skin. This lapse of time between the two entries substantiates the latter view.

Microtus californicus constrictus Bailey. Biological Survey coll.

North Amer. Fauna, No. 17, pp. 15, 36–37, June 6, 1900.

98347. Skin and skull. Adult male. Cape Mendocino, California. September 6, 1899. Collected by V. Bailey. Original number 7174.

Well-made skin in good condition; skull perfect.

Microtus cricetulus Miller.

Proc. Acad. Nat. Sci. Phila., 1899, p. 294, August 9, 1899.

84043. Skin and skull. Adult male. Banks of the Tso Kyun, Ladak; altitude 16,000 feet. August 11, 1897. Collected by Dr. W. L. Abbott. Catalogued March 3, 1898.

Well-made skin in good condition; skull perfect.

Arvicola curtata Cope.

Proc. Acad. Nat. Sci. Phila., 1868, p. 2. Presented at meeting of January 21, 1868.
=**Microtus curtatus** (Cope). See Miller, North Amer. Fauna, No. 12, p. 51, July 23, 1896.

$\frac{10267}{37419}$. Fragments of skull and feet. Collected by Prof. W. M. Gabb at Pigeon Spring, Mount Magruder, Nevada, near boundary between Inyo County, California, and Esmeralda County, Nevada. Skin catalogued October 15, 1872; skull, May 5, 1898.

The following is an inventory of the fragments: (1) Both hind feet, one of them with tibia attached; (2) both fore feet, one of them with radius and ulna attached, the other radius and ulna present and a portion of each humerus present; (3) a few small, almost unidentifiable fragments of the skull; (4) all the upper molars, still attached or glued to a good-sized fragment of the palate, the free ends of the incisors in small parts of the premaxillaries; (5) all of the lower jaw teeth except the last molar of the left side; the two other molars of that side are attached to a piece of the mandible; the incisors rather fragmentary.

Type not designated by number. In the catalogue, in the handwriting of the original entry, the specimen is marked "Cope's type." The present specimen is indicated as the type by Dr. Coues in Monographs of North American Rodentia, pages 215 to 217, where it appears that the specimen was in as bad condition in 1877 as it is now. One of Dr. Coues's labels, reading "No. 10267, Type of *Arvicola curtata* Cope," is still attached to the specimen.

Microtus dutcheri Bailey. Biological Survey Collection.

Proc. Biol. Soc. Wash., XII, pp. 85–86, April 30, 1898.

$\frac{29769}{41848}$. Skin and skull. Adult male. Big Cottonwood Meadows, Mount Whitney, California. July 10, 1891. Collected by Dr. B. H. Dutcher, U. S. A. Original number 69.

Well-made skin in good condition; skull perfect.

Arvicola edax Le Conte.

Proc. Acad. Nat. Sci. Phila., VI, p. 405, this paper was favorably reported for publication October 25, 1853.

=**Microtus edax** (Le Conte). See Allen, Bull. Amer. Mus. Nat. Hist., VIII, p. 268, December 4, 1896.

$\frac{4721}{37298}$. Skin and skull. Collected by J. L. Le Conte in California, south of San Francisco. Skin catalogued April 13, 1861; skull, April 27, 1897.

Specimen made into a modern study skin, in good condition, and skull removed in the early part of 1897. The posterior and basal portions of cranium have been cut away, including the left upper molar. The posterior parts of the right half of mandible are broken away. Upper incisors are broken.

Type not designated by number. The present specimen seems to be the only one in the collection collected in California by Le Conte which is positively stated by Baird, page 532 of his Mammals, to be the type. In the table on page 173, Monographs of North American Rodentia, Dr. Coues says the present specimen, 4721, is the type of *edax*.

Microtus elymocetes Osgood. Biological Survey collection.

Proc. Biol. Soc. Wash., XIX, pp. 71-72, May 1, 1906.

137323. Skin and skull. Adult male. Montague Island, Prince William Sound, Alaska. May 12, 1905. Collected by C. Sheldon. Original number 8 (5448x).

Well-made skin in good condition; skull perfect.

Arvicola fertilis True.

Proc. U. S. Nat. Mus., XVII, No. 976, p. 10, May 8, 1894.

=**Microtus fertilis** (True). See Miller, North Amer. Fauna, No. 12, p. 55, July 23, 1896.

$\frac{20147}{36610}$. Skin and skull. Adult female. Pir Panjal Range, Kashmir; altitude 8,500 feet. August 30, 1891. Collected by Dr. W. L. Abbott. Catalogued May 9, 1892.

Well-made skin in good condition; skull perfect, except that the bullæ and pterygoids have been cut away.

Microtus abbreviatus fisheri Merriam. Biological Survey coll.

Proc. Wash. Acad. Sci., II, p. 23, March 14, 1900.

97976. Skin and skull. Adult male. St. Matthew Island, Bering Sea. July 15, 1899. Collected by Dr. A. K. Fisher. Original number 2189.

Well-made skin in good condition; skull perfect.

Microtus fulviventer Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XII, p. 106, April 30, 1898.

68250. Skin and skull. Adult male. Cerro San Felipe, Oaxaca, Mexico. August 22, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 6601.

Well-made skin in good condition; skull perfect, except for absence of both coronoid processes and left angular process of mandible.

Microtus mexicanus guadalupensis Bailey. Biological Survey coll.

Proc. Biol. Soc. Wash., XV, pp. 118–119, June 2, 1902.

109191. Skin and skull. Adult male. Guadalupe Mountains, Texas; altitude, 7,800 feet. August 21, 1901. Collected by V. Bailey. Original number 7807.

Well-made skin in good condition; skull perfect.

Microtus guatemalensis Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XII, p. 108, April 30, 1898.

76777. Skin and skull. Adult male. Todos Santos, Huehuetenango, Guatemala. December 30, 1895. Collected by E. W. Nelson and E. A. Goldman. Original number 8960.

Well-made skin in good condition; skull perfect.

Arvicola (Pedomys) haydenii Baird.

Mammals of North America, p. 543, 1857.

=**Microtus ochrogaster haydenii** (Baird). See Osgood, Proc. Biol. Soc. Wash., XX, p. 48, April 18, 1907.

$\frac{699}{1862}$. Skin and skull. Adult male. Collected in 1854 by Dr. F. V. Hayden at Fort Pierre, then in "Nebraska," now in Stanley County, South Dakota. Catalogued May 19, 1855.

Skin badly made up, legs spreading, tail not skinned out; a small patch on each side of body without hair; general condition of pelage good. Skull in good condition, but left half of mandible lost.

This was Baird's only specimen and was designated by number.

Microtus innuitus Merriam. Biological Survey collection.

Proc. Wash. Acad. Sci., II, pp. 21–22, March 14, 1900.

99373. Skull only. Adult. St. Lawrence Island, Bering Sea. July 13, 1899. Collected by Dr. C. Hart Merriam.

Skull obtained from an owl pellet; slightly stained; last left upper molar missing; left parietal slightly fractured; left coronoid process and right mandibular ramus missing.

Microtus kadiacensis Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XI, p. 222, July 15, 1897.

=**Microtus operarius kadiacensis** Merriam. See Osgood, North Amer. Fauna, No. 21, p. 64, September 26, 1901.

65827. Skin and skull. Young adult female. Kodiak Island, Alaska. September 12, 1893. Collected by B. J. Bretherton. Original number 213.

Well-made skin in good condition; skull perfect except for absence of left audital bulla.

Arvicola longirostris Baird.

Mammals of North America, p. 530, 1857.

=**Microtus montanus** (Peale). See Bailey, North Amer. Fauna, No. 17, p. 27, June 6, 1900.

$\frac{1268}{2220}$. Mounted skin and fragmentary skull. Adult female. Upper Pitt River, California. September, 1855. Collected by Dr. J. S. Newberry. Catalogued January, 1856.

Mounted specimen in fair condition; a little hair gone from the right side. Skull very fragmentary. Both halves of lower jaw complete. Upper teeth loose, but all present from each side and in a separate glass tube. A few other fragments are in another tube.

Baird had but one specimen, the above, which he designated by number.

Microtus ludovicianus Bailey. Biological Survey collection.

North Amer. Fauna, No. 17, pp. 74–75, June 6, 1900.

96624. Skin and skull. Adult male. Iowa, Calcasieu Parish, Louisiana. April 7, 1899. Collected by V. Bailey. Original number 6767.

Well-made skin in good condition; skull perfect.

Microtus macfarlani Merriam.

Proc. Wash. Acad. Sci., II, p. 24, March 14, 1900.

$\frac{9155}{37347}$. Skin and skull. Fort Anderson, north of Great Bear Lake, Mackenzie, Canada. 1865. Collected by R. MacFarlane. Original number 3179. Skin catalogued July, 1868; skull, March 31, 1898.

Specimen remade into a modern study skin and the skull removed and cleaned in March, 1898. The skin is well preserved and in good condition save for some apparent lengthwise stretching. Skull perfect, except for loss of right malar and a hole in left audital bulla.

Arvicola (Mynomes) macropus Merriam. Biological Survey coll.

North Amer. Fauna, No. 5, pp. 59–61, pl. 2, figs. 7–8, July 30, 1891.

=**Microtus richardsoni macropus** (Merriam). See Bailey, North Amer. Fauna, No. 17, p. 61, June 6, 1900.

$\frac{23887}{31291}$. Skin and skull. Adult female. Pahsimeroi Mountains, Idaho. September 16, 1890. Collected by Dr. C. Hart Merriam and V. Bailey. Original number 1803.

Well-made skin in good condition; skull perfect.

Microtus macrurus Merriam. Biological Survey collection.

Proc. Acad. Nat. Sci. Phila., p. 353, October 4, 1898.

66151. Skin and skull. Adult female. Lake Cushman, Olympic Mountains, Washington. June 26, 1894. Collected by C. P. Streator. Original number 3975.

Well-made skin in good condition; skull perfect, except for broken frontals and right audital bulla.

Microtus miurus Osgood. Biological Survey collection.

North Amer. Fauna, No. 21, pp. 64–66, September 26, 1901.

107175. Skin and skull. Adult male. Head of Bear Creek, near Hope, Turnagain Arm, Cook Inlet, Alaska. September 4, 1900. Collected by W. H. Osgood and E. Heller. Original number 1349.

Well-made skin in good condition; skull perfect, except for slight perforation in right frontal.

Arvicola modesta Baird.

Mammals of North America, p. 535, 1857.

=**Microtus pennsylvanicus modestus** (Baird). See Bailey, North Amer. Fauna, No. 17, p. 20, June 6, 1900.

$\frac{594}{1717}$. Skin and skull. Immature. Sawatch Pass, Rocky Mountains, near Cochetopa Pass, Saguache County, Colorado. Collected by Mr. Kreutzfeldt. Original number 16. Pacific Railroad Survey near 38° lat., Lieut. E. G. Beckwith, U. S. A. Catalogued March 19, 1855.

Skin very fragmentary and dilapidated. Right fore foot still attached. Two other feet loose and also tip of tail. Skull young; ends of nasals and upper incisors broken, both malars, all the occipital bones, the interparietal and most of the parietals missing. Left half of the mandible has angular and coronoid processes broken away; right half, part of angular process and entire coronoid missing.

Of Baird's two specimens, both designated by numbers, the above is the only one that he refers with certainty to *modesta*.

Arvicola montana Peale. See page 289.

Arvicola montosa True.

Proc. U. S. Nat. Mus., XVII, No. 976, p. 11, May 8, 1894.

=**Microtus montosus** (True). See Miller, Proc. Acad. Nat. Sci. Phila., 1899, p. 293, August 9, 1899.

$\frac{20145}{35608}$. Skin and skull. Half-grown male. Central Kashmir, altitude 11,000 feet. October 4, 1891. Collected by Dr. W. L. Abbott. Catalogued May 9, 1892.

Well-made skin in good condition, but rather contracted posteriorly; skull injured about the pterygoids, a hole in right bulla, and both coronoid processes of mandible broken; otherwise perfect.

Arvicola (Mynomes) mordax Merriam. Biological Survey coll.

North Amer. Fauna, No. 5, pp. 61–62, pl. 2, figs. 3–4, July 30, 1891.

=**Microtus mordax** (Merriam). See Trouessart, Catalogus Mammalium, p. 564, 1897.

$\frac{24231}{31635}$. Skin and skull. Adult male. Sawtooth Lake, Idaho. September 29, 1890. Collected by Dr. C. Hart Merriam and V. Bailey. Original number 1903.

Well-made skin in good condition; skull perfect.

Arvicola (Mynomes) nanus Merriam. Biological Survey collection.

North Amer. Fauna, No. 5, pp. 62–63, pl. 2, figs. 5–6, July 30, 1891.

=**Microtus nanus** (Merriam). See Miller, Proc. Biol. Soc. Wash., XI, p. 67, April 21, 1897.

$\frac{23853}{31253}$. Skin and skull. Adult female (not male, as in original description). Pahsimeroi Mountains, Idaho, September 16, 1890. Collected by Dr. C. Hart Merriam and V. Bailey. Original number 1809.

Well-made skin in good condition; skull perfect.

Microtus pinetorum nemoralis Bailey. Biological Survey collection.

Proc. Biol. Soc. Wash., XII, pp. 89–90, April 30, 1898.

87246. Skin and skull. Adult female. Stilwell, Boston Mountains, Oklahoma. April 7, 1897. Collected by J. A. Loring. Original number 3905.

Well-made skin in good condition; skull perfect.

Microtus nevadensis Bailey. Biological Survey collection.

Proc. Biol. Soc. Wash., XII, pp. 86–87, April 30, 1898.

$\frac{26877}{34201}$. Skin and skull. Adult male (not female, as in original description). Ash Meadows, Nye County, Nevada. March 2, 1891. Collected by E. W. Nelson. Original number 577.

Well-made skin in good condition; skull perfect, except for broken audital bullæ and left coronoid process.

Arvicola occidentalis Peale.

U. S. Exploring Expedition, Mammalia and Ornithology, p. 45, 1848.

=**Microtus townsendi** (Bachman). See Bailey, North Amer. Fauna, No. 17, p. 46, June 6, 1900.

$\frac{10083}{4167}$. Skin and skull. Puget Sound, Washington. U. S. Exploring Expedition, 1838 to 1842. Collected by T. R. Peale. Skin catalogued 1872; skull, 1860.

Poorly made skin, tail not skinned out. It has somewhat the look of having been in alcohol at one time. Some of the hair has slipped from each side, especially the right. Skull fairly good for an old specimen; right zygoma missing and both bullæ and both pterygoids broken, coronoid process of right half of mandible broken.

Type not designated by number. In the entry of the skin in 1872 (twelve years after the skull was entered in the catalogue) under the remarks column is written, in the handwriting of the original entry, "type of *occidentalis*." On page 535 of Mammals of North America, Baird speaks of having the original specimen. One of Doctor Coues's labels is attached marked "Monograph of American Muridæ. Dr. Elliott Coues, U. S. A. No. 10083. Type of *Arvicola* '*occidentalis*' Peale." In the table on page 173, Monographs of North American Rodentia, Doctor Coues has 10083 marked as the type of "*occidentalis*."

Arvicola operarius Nelson.

Proc. Biol. Soc. Wash., VIII, p. 139, December 28, 1893.

=**Microtus operarius** (Nelson). See Trouessart, Catalogus Mammalium, p. 564, 1897.

$\frac{14379}{22222}$. Skin and skull. Adult. St. Michael, Alaska. November, 1879. Collected by E. W. Nelson. Original number 122. Skin catalogued June 11, 1884; skull, March 19, 1886.

Skin well preserved, but poorly made up, and right fore leg missing. Skull perfect, except coronoid of left half of mandible broken away, left bulla slightly injured.

Microtus miurus oreas Osgood. Biological Survey collection.

Proc. Biol. Soc. Wash., XX, pp. 61–62, April 18, 1907.

148596. Skin and skull. Adult male. Head of Toklat River, Alaskan Range, Alaska. August 8, 1906. Collected by C. Sheldon. Original number 47 (6289x).

Well-made skin in good condition; skull perfect, except for broken left audital bulla and two slight perforations in brain case.

Microtus pamirensis Miller.

Proc. Acad. Nat. Sci. Phila., 1899, p. 287, August 9, 1899.

62161. Skin and skull. Adult male. Tagdumbash, Pamir; altitude 12,000 feet. June 18, 1894. Collected by Dr. W. L. Abbott. Catalogued May 16, 1895.

Well-made skin in good condition; skull with left pterygoid broken and hole in right audital bulla; otherwise perfect.

Arvicola pauperrima Cooper.

Amer. Nat., II, p. 535, December, 1868.

=**Microtus pauperrimus** (Cooper). See Miller, North Amer. Fauna, No. 12, p. 51, July 23, 1896.

$\frac{10268}{35071}$. Skin and skull. Adult male, "(♂)." Great Plains of the Columbia, near the Snake River, southwestern Washington. October 9, 1860. Collected by Dr. J. G. Cooper. Original number 126. Skin catalogued October 15, 1872; skull, March 5, 1891.

Skin in poor condition; parts about head and shoulders glued on to a cotton filling. Posterior upper parts good for color; all the feet present, also the tail. Skull in fragments, viz: (1) The premaxillæ and maxillæ all in one piece, containing all the upper jaw teeth except the last right and left upper molars; (2) the interparietal with attached portions of the parietals; (3) a small piece of the left squamosal; (4) the horizontal parts of each half of the mandible containing all the lower jaw teeth, of which the left incisor is broken at the cutting edge.

Type designated by the original number.

Arvicola phæus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., VII, pp. 171–172, September 29, 1892.

=**Microtus mexicanus phæus** (Merriam). See Bailey, North Amer. Fauna, No. 17, p. 54, June 6, 1900.

$\frac{33605}{45640}$. Skin and skull. Adult female. North slope Sierra Nevada de Colima, Jalisco, Mexico; altitude 10,000 feet. April 21, 1892. Collected by E. W. Nelson. Original number 2516.

Well-made skin in good condition; skull perfect, except for injured occipital condyles and right audital bulla.

Microtus unalascensis popofensis Merriam. Biol. Survey coll.

Proc. Wash. Acad. Sci., II, pp. 22–23, March 14, 1900.

97956. Skin and skull. Adult male. Popof Island, Shumagin Islands, Alaska. July 16, 1899. Collected by W. E. Ritter. Original number 2200 (Dr. A. K. Fisher).

Well-made skin in good condition; skull perfect, except for slight perforation of right audital bulla and a perforation at base of nasals.

Arvicola (Pitymys) pinetorum quasiater Coues. See page 289.

Microtus ravidulus Miller.

Proc. Acad. Nat. Sci. Phila., 1899, p. 284, August 9, 1899.

62159. Skin and skull. Adult female. Okchi, valley of the Aksai; altitude 7,000 feet, Eastern Turkestan. November 7, 1893. Collected by Dr. W. L. Abbott. Catalogued May 16, 1895.

Well-made skin in good condition; skull perfect, except some chips out of coronoid and angular processes of the mandible.

Arvicola scalopsoides Audubon and Bachman.

Proc. Acad. Nat. Sci. Phila., I, p. 97. Submitted for publication October 5, 1841.

=**Microtus pinetorum scalopsoides** (Audubon and Bachman). See Batchelder, Proc. Bost. Soc. Nat. Hist., XXVII, p. 187, October, 1896.

10264. Skin with skull inside. Long Island, New York. Collected by Major J. E. Le Conte, U. S. A. Catalogued October 15, 1872, so that the specimen must have been acquired long after the original description.

Skin in rather poor condition. It has somewhat the appearance of having been made up out of alcohol. The left fore foot and right hind foot are missing. On the left side there is a considerable patch without hair.

Type not designated by number. "Type of *scalopsoides*" is written in the remarks column of the catalogue in the handwriting of the original entry. In the table on page 224 of Monographs of North American Rodentia Dr. Coues calls this specimen, 10264, "Type of '*scalopsoides*' LeC." The specimen also bears one of Coues's labels reading "Monograph of American Muridæ, Dr. Elliott Coues, U. S. A., No. 10264. Type of A. '*scalopsoides*' apud Le Conte (=*pinetorum*) Long Island."

Microtus scirpensis Bailey. Biological Survey collection.

North Amer. Fauna, No. 17, pp. 15, 38–39, June 6, 1900.

$\frac{25979}{33386}$. Skin and skull. Adult female. Amargosa River, Inyo County, California. February 26, 1891. Collected by V. Bailey. Original number 2520.

Well-made skin in good condition; skull perfect.

Microtus serpens Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XI, p. 75, April 21, 1897.

76303. Skin and skull. Adult male. Agassiz, British Columbia. December 2, 1895. Collected by C. P. Streator. Original number 5068.

Well-made skin in good condition; skull perfect, except for slight perforation in brain case.

Microtus sitkensis Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XI., p. 221, July 15, 1897.

73839. Skin and skull. Young adult male. Sitka, Alaska. August 3, 1895. Collected by C. P. Streator. Original number 4745.

Well-made skin in good condition; skull perfect.

Arvicola trowbridgii Baird.

Mammals of North America, p. 529, 1857.

=**Microtus californicus** (Peale). See Bailey, North Amer. Fauna, No. 17, p. 35, June 6, 1900.

$\frac{370}{1284}$. Mounted specimen and skull. Monterey, California. Collected by Lieut. W. P. Trowbridge, U. S. A. Catalogued January 4, 1855.

The mounted specimen is a poor-looking object, with patches devoid of hair on each side. The skull is in fair condition; both malars, left pterygoid, and right last lower molar are missing.

Microtus tshuktshorum Miller.

Proc. Biol. Soc. Wash., XIII, p. 11, January 31, 1899.

$\frac{8419}{87610}$. In alcohol, skull removed. Adult female. Plover Bay, eastern Siberia. Collected by Lieut. John Davison. Catalogued January 12, 1866; skull, November 10, 1898.

Specimen is fairly well preserved; hair rather loose, and a considerable patch on right side devoid of hair; skull perfect.

Microtus umbrosus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XII, p. 107, April 30, 1898.

68480. Skin and skull. Adult female. Mount Zempoaltepec, Oaxaca, Mexico. July 10, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 6412.

Well-made skin in good condition; skull perfect.

Microtus unalascensis Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XI, p. 222, July 15, 1897.

$\frac{30772}{42672}$. Skin and skull. Immature female. Unalaska, Alaska. August 13, 1891. Collected by Dr. C. Hart Merriam.

Well-made skin in good condition; skull perfect, except for slight perforation in brain case.

Microtus californicus vallicola Bailey. Biological Survey coll.

Proc. Biol. Soc. Wash., XII, p. 89, April 30, 1898.

$\frac{25393}{32806}$. Skin and skull. Adult female. Lone Pine, Inyo County, California. December 23, 1890. Collected by E. W. Nelson. Original number 149.

Well-made skin in good condition; skull perfect, except for slightly fractured frontals.

Microtus yakutatensis Merriam. Biological Survey collection.

Proc. Wash. Acad. Sci., II, p. 22, March 14, 1900.

98005. Skin and skull. Adult male. North shore Yakutat Bay, Alaska. June 19, 1899. Collected by Dr. C. Hart Merriam. Original number 2101 (Dr. A. K. Fisher).

Well-made skin in good condition; skull perfect.

Genus ASCHIZOMYS.

Aschizomys lemminus Miller.

Proc. Acad. Nat. Sci., Phila., 1898, p. 369, October 15, 1898.

$\frac{9911}{37299}$. Skin and skull and dried body. Adult male. Kelsey Station, Plover Bay, Bering Strait, Siberia. Collected by C. W. Baxter, Western Union Company's Overland International Telegraph Expedition. Original number 423. Skin catalogued January, 1872; skull, April 29, 1897.

Well-made skin in good condition; skull perfect, except on the left side, where the roots of the molars have been purposely exposed. The dried-up body is also present. The specimen was originally preserved in alcohol and made into a study skin many years later.

Genus EVOTOMYS.

Evotomys alascensis Miller.

Proc. Acad. Nat. Sci. Phila., 1898, p. 364, October 15, 1898.

=**Evotomys dawsoni** Merriam. See Osgood, North Amer. Fauna, No. 24, p. 34, November 23, 1904.

$\frac{14359}{22226}$. Skin and skull. Adult male. St. Michael, Alaska. October 26, 1879. Collected by E. W. Nelson. Original number 96. Skin catalogued June 11, 1884; skull, March 19, 1886.

Recently remade as a study skin, in good condition; skull perfect, but rather poorly cleaned.

Evotomys californicus Merriam. Biological Survey collection.

North Amer. Fauna, No. 4, p. 26, October 8, 1890.

$\frac{17011}{23920}$. Skin and skull. Adult male. Eureka, California. June 3, 1889. Collected by Dr. T. S. Palmer. Original number 110.

Well-made skin in good condition; skull perfect, except for broken tip of left nasal.

Evotomys caurinus Bailey. Biological Survey collection.

Proc. Biol. Soc. Wash., XII, pp. 21–22, January 27, 1898.

89460. Skin and skull. Adult male. Lund, Malaspina Inlet, British Columbia. July 18, 1897. Collected by E. A. Preble. Original number 2147.

Well-made skin in good condition; skull perfect.

Evotomys idahoensis Merriam. Biological Survey collection.

North Amer. Fauna, No. 5, pp. 66–67, pl. 3, figs. 5–6, July 30, 1891.

$\frac{24283}{31687}$. Skin and skull. Adult female. Sawtooth Lake, Idaho. October 4, 1890. Collected by Dr. C. Hart Merriam and V. Bailey. Original number 1936.

Well-made skin in good condition; skull perfect.

Evotomys gapperi loringi Bailey. Biological Survey collection.

Proc. Biol. Soc. Wash., XI, pp. 125–126, pl. 3, fig. 3, May 13, 1897.

75795. Skin and skull. Adult male. Portland, North Dakota. November 22, 1895. Collected by J. A. Loring. Original number 3438.

Well-made skin in good condition; skull perfect.

Evotomys mazama Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XI, pp. 71–72, April 21, 1897.

79913. Skin and skull. Adult male. Crater Lake, Mount Mazama, Oregon. August 15, 1896. Collected by Dr. C. Hart Merriam and V. Bailey. Original number 5765.

Well-made skin in good condition; skull perfect.

Evotomys nivarius Bailey. Biological Survey collection.

Proc. Biol. Soc. Wash., XI, pp. 136–137, pl. 3, fig. 4, May 13, 1897.

66203. Skin and skull. Adult female. Mount Ellinor, Olympic Mountains, Washington. July 9, 1894. Collected by C. P. Streator. Original number 4025.

Well-made skin in good condition; skull perfect.

Evotomys norvegicus Miller.

Proc. Wash. Acad. Sci., II, p. 93, July 26, 1900.

84674. Skin and skull. Adult female. Bergen, Norway. May 31, 1898. Collected by Miss Thora Steineger. Original number 20. Catalogued August 20, 1898.

Well-made skin in good condition; skull perfect, except broken coronoids of the mandible.

Evotomys obscurus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XI, p. 72, April 21, 1897.

80413. Skin and skull. Adult male. Prospect, Rogue River Valley, Oregon. August 29, 1896. Collected by E. A. Preble. Original number 1455.

Well-made skin in good condition; skull perfect.

Evotomys occidentalis Merriam. Biological Survey collection.

North Amer. Fauna, No. 4, pp. 25–26, pl. 2, fig. 1, October 8, 1890.

$\frac{17117}{24361}$. Skin and skull. Adult male. Aberdeen, Chehalis County, Washington. August 16, 1889. Collected by Dr. T. S. Palmer. Original number 308.

Well-made skin in good condition; skull perfect, except for broken coronoids.

Evotomys orca Merriam. Biological Survey collection.

Proc. Wash. Acad. Sci., II, pp. 24–25, March 14, 1900.

98028. Skin and skull. Adult female. Orca, Prince William Sound, Alaska. June 28, 1899. Collected by Dr. A. K. Fisher. Original number 2139.

Well-made skin in good condition; skull perfect.

Evotomys hercynicus suecicus Miller.

Proc. Wash. Acad. Sci. II, p. 101, July 26, 1900.

85046. Skin and skull. Adult female. Upsala, Sweden. August 6, 1898. Collected by J. A. Loring. Original number 5009. Catalogued September 27, 1898.

Well-made skin in good condition; skull rather damaged, right half of brain case entirely broken away, angular and coronoid processes of right half of mandible broken off.

Evotomys vasconiæ Miller.

Proc. Wash. Acad. Sci., II, p. 96, July 26, 1900.

86994. Skin and skull. Adult male. Montrejeau, Hautes-Pyrenees, France. July 4, 1899. Collected by Robert T. Young. Original number 625. Catalogued October 10, 1899.

Well-made skin in good condition; skull perfect, except for a few almost unnoticeable chippings.

Evotomys wrangeli Bailey. Biological Survey collection.

Proc. Biol. Soc. Wash., XI, p. 120, pl. 3, fig. 5, May 13, 1897.

74724. Skin and skull. Adult female. Wrangel, Alaska. September 1, 1895. Collected by C. P. Streator. Original number 4835.

Well-made skin in good condition; skull perfect, except for injury to posterior end of palate.

Genus PHENACOMYS.

Phenacomys albipes Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XIV, pp. 125–126, July 19, 1901.

97236. Skin and skull. Adult male. Redwoods near Arcata, Humboldt Bay, California. May 24, 1899. Collected by Dr. W. K. Fisher. Original number 821.

Well-made skin in good condition; skull perfect.

Phenacomys longicaudus True.

Proc. U. S. Nat. Mus., XIII, No. 826, p. 303, November 15, 1890.

$\frac{12071}{34808}$. Skin and skull. Marshfield, Coos County, Oregon. August, 1890. Collected by Aurelius Todd. Catalogued September 8, 1890.

Recently made over into a fair study skin, tail has never been skinned out. Skull in rather large and disarticulated fragments. All the teeth are present; both parietals; both frontals; both premaxillæ; most of both maxillæ; both bullæ, and parts about and including the basioccipital and basisphenoid, and most of each half of the mandible.

Phenacomys mackenzii Preble. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, p. 182, August 6, 1902.

110625. Skin and skull. Adult male. Fort Smith, Slave River, Mackenzie, Canada. June 29, 1901. Collected by E. A. Preble. Original number 4271.

Well-made skin in good condition; skull perfect.

Phenacomys orophilus Merriam. Biological Survey collection.

North Amer. Fauna, No. 5, pp. 65–66, pl. 3, figs. 3–4, July 30, 1891.

$\frac{23856}{31256}$. Skin and skull. Adult female. Salmon River Mountains, near head of Timber Creek, Idaho. August 28, 1890. Collected by Dr. C. Hart Merriam and V. Bailey. Original number 1710.

Well-made skin in good condition; skull perfect, except for badly injured frontals and slightly perforated audital bullæ.

Phenacomys preblei Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XI, p. 45, March 16, 1897.

74513. Skin and skull. Adult male. Longs Peak, Colorado. August 12, 1895. Collected by E. A. Preble. Original number 647.

Well-made skin in good condition; skull perfect.

Phenacomys truei Allen.

Bull. Amer. Mus. Nat. Hist., VI, p. 331, November 7, 1894.

=**Phenacomys orophilus** Merriam. See Miller, Proc. Biol. Soc. Wash., XI, p. 80, April 21, 1897.

$\frac{3056}{36884}$. Skin and skull. Adult. "Black Hills." August 10, 1857. Collected by Dr. W. A. Hammond, U. S. A. Original number 109. Wagon road to Bridgers Pass, Rocky Mountains, Lieut. F. T. Bryan, U. S. A. Miller, *loc. cit.*, says, "It is therefore almost beyond doubt that the type of *Phenacomys truei* was collected in Albany County or Laramie County, Wyoming, a few miles northeast of the present town of Laramie." Skin catalogued October 7, 1857; skull, November 13, 1894.

Skin in poor condition, the anterior parts much torn and glued to a cotton filling. Right fore leg missing. Apparently good for color. Skull very fragmentary; practically of value only for the molar teeth, of which three of the left mandibular ramus are missing.

Genus FIBER.

Fiber zibethicus hudsonius Preble. Biological Survey collection.

North Amer. Fauna, No. 22, pp. 53–54, October 31, 1902.

106881. Skin and skull. Adult male. Fort Churchill, Keewatin, Canada. August 9, 1900. Collected by A. E. Preble. Original number 3081 (E. A. Preble).

Well-made skin in good condition; skull perfect.

Fiber macrodon Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XI, p. 143, May 13, 1897.

75940. Skin and skull. Adult female. Lake Drummond, Dismal Swamp, Virginia. October 9, 1895. Collected by Dr. A. K. Fisher. Original number 1788.

Well-made skin in good condition; skull perfect.

Fiber zibethicus ripensis Bailey. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, p. 119, June 2, 1902.

109012. Skin and skull. Adult male. Carlsbad, Pecos River, New Mexico. July 26, 1901 (not July 25 as in original description). Collected by V. Bailey. Original number 7757.

Well-made skin in good condition; left fore foot injured by insects and hanging by a thread of skin; skull perfect.

Fiber spatulatus Osgood. Biological Survey collection.

North Amer. Fauna, No. 19, pp. 36–37, pl. 6, fig. 4, October 6, 1900.

98567. Skin and skull. Young adult female. Lake Marsh, Yukon, Canada. July 3, 1899. Collected by W. H. Osgood. Original number 552.

Well-made skin in good condition, except for absence of tip of tail; left fore foot detached; skull perfect.

Genus MYOTALPA.

Myotalpa cansus Lyon.

Smithsonian Miscell. Coll., L, No. 1726, p. 134, pl. 15, figs. 4–10, July 9, 1907.

144022. Skin and skull. Adult female. Taocheo, Province of Kan-su, China. May 7, 1906. Collected by W. W. Simpson. Original number 7. Catalogued March 6, 1907.

Well-made skin in good condition; skull perfect.

Genus NEOTOMA.

Neotoma mexicana bullata Merriam. Biological Survey coll.

Proc. Biol. Soc. Wash., IX, pp. 122–123, July 2, 1894.

$\frac{16863}{23774}$. Skin and skull. Adult male. Santa Catalina Mountains, Arizona. June 1, 1889. Collected by V. Bailey. Original number 114.

Well-made skin in good condition; skull perfect, except for absence of left coronoid process.

Neotoma cumulator Mearns.

Preliminary Diagnoses of New Mammals of the Genera Sciurus, Castor, Neotoma, and Sigmodon, from the Mexican Border of the United States, p. 3, March 5, 1897. (Reprinted in Proc. U. S. Nat. Mus., XX, No. 1132, p. 503, January 19, 1898.)

60348. Skin and skull. Adult male. Old Fort Yuma, San Diego County, California. April 2, 1894. Collected by Dr. E. A. Mearns, U. S. A., and F. X. Holzner. Original number 3473. International Boundary Commission. Catalogued May 8, 1894.

Well-made skin in good condition; skull perfect.

Neotoma desertorum Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., IX, pp. 125–126, July 2, 1894.

$\frac{25739}{33139}$. Skin and skull. Adult male. Furnace Creek, Death Valley, California. January 31, 1894. Collected by Dr. T. S. Palmer. Original number 43.

Well-made skin in good condition; skull perfect.

Neotoma fuscipes dispar Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., IX, pp. 124–125, July 2, 1894.

$\frac{25301}{32804}$. Skin and skull. Adult male. Lone Pine, Inyo County, California. December 25, 1890. Collected by V. Bailey. Original number 2310.

Well-made skin in good condition; skull perfect.

Neotoma fulviventer Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., IX, pp. 121-122, July 2, 1894.

50165. Skin and skull. Adult female. Toluca Valley, Mexico, Mexico. November 5, 1892. Collected by E. W. Nelson. Original number 3744.

Well-made skin in good condition, except for a small bare space on abdomen; skull perfect.

Neotoma occidentalis fusca True.

Diagnoses of Some Undescribed Wood Rats (Genus Neotoma) in the National Museum, p. 2, June 27, 1894. (Reprinted in Proc. U. S. Nat. Mus., XVII, No. 1006, p. 354, November 15, 1894.)

=**Neotoma cinerea fusca** (True). See Trouessart, Catalogus Mammalium, p. 544, 1897.

3370. Skin without skull. Fort Umpqua, Douglas County, Oregon. Collected by Dr. E. P. Vollum. Catalogued in 1859, about February 25.

Specimen remade into a modern study skin, February, 1902; a considerable bare spot on left side, a smaller one on nose, right side, and on belly.

Neotoma fuscipes Baird.

Mammals of North America, p. 495, 1857.

22026. Skeleton. Adult male. Petaluma, California. February, 1856. Collected by E. Samuels.

The original specimen was No. 2679, preserved in alcohol, but about 1885 it was prepared as a skeleton, No. 22026. Now in good condition and on exhibition in the Division of Comparative Anatomy. Skeleton catalogued March 9, 1885; original specimen April 10, 1857.

The description immediately following the brief diagnosis reads "(2679. ♂). This animal * * *." For that reason the specimen bearing this number is considered the type.

Neotoma goldmani Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XVI, p. 48, March 19, 1903.

116894. Skin and skull. Young adult male. Saltillo, Coahuila, Mexico. April 18, 1902. Collected by E. W. Nelson and E. A. Goldman. Original number 15101.

Well-made skin in good condition; skull perfect.

Neotoma isthmica Goldman. Biological Survey collection.

Proc. Biol. Soc. Wash., XVII, pp. 80-81, March 21, 1904.

73187. Skin and skull. Adult female. Huilotepec, 8 miles south of Tehuantepec, Oaxaca, Mexico. May 5, 1895. Collected by E. W. Nelson and E. A. Goldman. Original number 7843.

Well-made skin in good condition; skull perfect.

Neotoma latifrons Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., IX, p. 121, July 2, 1894.

50135. Skin and skull. Adult male. Querendaro, Michoacan, Mexico. August 8, 1892. Collected by E. W. Nelson. Original number 3058.

Well-made skin in good condition; skull perfect.

Neotoma leucodon Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., IX, pp. 120–121, July 2, 1894.

50137. Skin and skull. Adult male. San Luis Potosi, Mexico. August 4, 1892. Collected by E. W. Nelson. Original number 3076.

Well-made skin in good condition, except for a bare space on throat; skull perfect, except for absence of left audital bulla.

Neotoma micropus littoralis Goldman. Biological Survey coll.

Proc. Biol. Soc. Wash., XVIII, pp. 31–32, February 2, 1905.

92952. Skin and skull. Adult male. Alta Mira, Tamaulipas, Mexico. April 10, 1898. Collected by E. A. Goldman. Original number 12281.

Well-made skin in good condition; skull perfect, except for absence of pterygoid processes.

Neotoma mexicana madrensis Goldman. Biological Survey coll.

Proc. Biol. Soc. Wash., XVIII, p. 31, February 2, 1905.

95244. Skin and skull. Adult female. Sierra Madre, near Guadalupe y Calvo, Chihuahua, Mexico. August 26, 1898. Collected by E. W. Nelson and E. A. Goldman. Original number 12918.

Well-made skin in good condition; skull perfect, except for absence of last left lower molar.

Neotoma magister Baird. Cotypes.

Mammals of North America, pp. 486, 498, 1857.

For remarks concerning the relations of this species with existing forms of *Neotoma*, See Rhoads, Mammals of Pennsylvania and New Jersey, p. 91, 1903.

The cotypes are as follows, all collected in the bone caves of Pennsylvania by Secretary S. F. Baird. The caves are undoubtedly those at Carlisle. The specimens were not entered in the Museum catalogue until October 24, 1872.

12206. Left half of mandible; complete, except for coronoid process.

12207. Right half of mandible; all molar teeth and angular process missing.

12208. Right half of mandible; last molar, angular, condyloid, and coronoid processes missing.

12209. Right half of mandible; all teeth, angular, condyloid, and coronoid processes missing.

12210. Left half of mandible; all molars, angular, coronoid, and condyloid processes missing.

12211. Middle portion of left half of mandible, containing last two molars and root of incisor.

12212. Left half of mandible; all the teeth, angular, condyloid, and coronoid processes missing.

12213. Anterior portion of right half of mandible, containing only the incisor.

12214. Fragment of left maxilla, containing the incisor.

Cotypes not designated by number. The above are the only specimens known in the Museum and are unquestionably the ones upon which Baird based his description.

Neotoma martinensis Goldman. Biological Survey collection.

Proc. Biol. Soc. Wash., XVIII, p. 28, February 2, 1905.

81074. Skin and skull. Adult female. San Martin Island, Lower California, Mexico. July 17, 1896. Collected by A. W. Anthony. Original number 39.

Well-made skin in good condition; skull perfect.

Neotoma intermedia melanura Merriam. Biological Survey coll.

Proc. Biol. Soc. Wash., IX, pp. 126–127, July 2, 1894.

$\frac{17819}{24756}$. Skin and skull. Young adult male. Ortiz, Sonora, Mexico. November 13, 1889. Collected by V. Bailey. Original number 671.

Well-made skin in good condition; skull perfect.

Neotoma mexicana Baird.

Proc. Acad. Nat. Sci. Phila., VII, p. 333, this paper was favorably reported for publication April 24, 1855.

$\frac{289}{1876}$. Skin (lost) and skull. Adult. Near Chihuahua, Chihuahua, Mexico. Collected by John Potts. Skin catalogued July 6, 1854; skull, March 10, 1855.

Skull lacks posterior portion of braincase; otherwise perfect. Skin lost.

Type not designated by number. In the original description it is said; "Collected near Chihuahua by John Potts, esq." Reference to Baird's Mammals of North America, page 942, shows that no. $\frac{289}{1876}$ is the only one to which that remark applies and it is thus regarded as the type. Unfortunately it was without a tail, and that is undoubtedly the reason why the measurements of another specimen, No. 565, are given in the original description.

Neotoma micropus Baird.

Proc. Acad. Nat. Sci. Phila., VII, p. 333, this paper was favorably reported for publication April 24, 1855.

1676. Skull. Adult male. Charco Escondido, Tamaulipas, Mexico. March, 1853. Collected by Lieut. D. N. Couch, U. S. A. There

should be a skin, No. 554, but it can not be found. Catalogued March 10, 1855.

The skull lacks all four occipital bones, and the periotics and tympanics of each side; otherwise it is in good condition.

Type not designated by number, but by referring to Baird's Mammals of North America, 1857, page 493, it is seen that the measurements given in the original description apply to No. 554 only, with corresponding skull number 1676, which consequently is considered the type.

Neotoma montezumæ Goldman. Biological Survey collection.

Proc. Biol. Soc. Wash., XVIII, p. 29, February 2, 1905.

81426. Skin and skull. Adult male. Zimapan, Hidalgo, Mexico. October 17, 1896. Collected by E. W. Nelson and E. A. Goldman. Original number 10275.

Well-made skin in good condition; right hind foot attached to body with wire; distal half of tail missing; skull perfect.

Neotoma navus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XVI, pp. 47–48, March 19, 1903.

116895. Skin and skull. Adult female. Sierra Guadalupe, Coahuila, Mexico. April 26, 1902. Collected by E. W. Nelson and E. A. Goldman. Original number 15130.

Well-made skin in good condition; skull perfect, except for absence of right coronoid process.

Neotoma nelsoni Goldman. Biological Survey collection.

Proc. Biol. Soc. Wash., XVIII, pp. 29–30, February 2, 1905.

54320. Skin and skull. Adult female. Perote, Vera Cruz, Mexico. June 3, 1893. Collected by E. W. Nelson. Original number 4935.

Well-made skin in good condition; skull perfect.

Neotoma nudicauda Goldman. Biological Survey collection.

Proc. Biol. Soc. Wash., XVIII, pp. 28–29, February 2, 1905.

79073. Skin and skull. Young adult female. Carmen Island, Lower California, Mexico. October 14, 1895. Collected by J. E. McLellan. Original number 1517.

Well-made skin in good condition; skull with vault of cranium mostly broken away; right audital bulla broken; right frontal with an irregular incision; right mandibular ramus lacking angular process; left ramus lacking coronoid and condyle.

Neotoma occidentalis Baird.

Proc. Acad. Nat. Sci., VII, p. 335, this paper was favorably reported for publication April 24, 1855.

=**Neotoma cinerea occidentalis** (Baird). See Merriam, North Amer. Fauna, No. 5, July 30, 1891.

572. Skin, formerly mounted; no record of a skull. Adult male. [S]halwater Bay, Pacific County, Washington. 1854, probably June.

Collected by Dr. J. G. Cooper. Original number 16. Northern Pacific Railroad Survey, Governor I. I. Stevens. Catalogued March 14, 1855.

According to records, specimen has been mounted, but has been made into a well-made study skin which has the appearance of being considerably bleached and discolored by age and exposure. The ears are somewhat ragged, and a small spot on nose, another on crown, and one on throat have the hair and epidermis missing.

Type not designated by number. It is indicated as coming from Shoalwater Bay and collected by Doctor Cooper. In the original description the dimensions are "Head and body 10 inches. Tail vertebræ $8\frac{5}{12}$ inches." By referring to Baird's Mammals of North America, page 497, where detailed measurements of the only three specimens from Shoalwater Bay are given, it is seen that the above figures belong to No. 572 only, which is therefore considered the type.

Neotoma ferruginea ochracea Goldman. Biological Survey coll.

Proc. Biol. Soc. Wash., XVIII, pp. 30–31, February 2, 1905.

$\frac{34142}{48219}$. Skin and skull. Nearly adult male. Atemajac, near Guadalajara, Jalisco, Mexico. May 21, 1892. Collected by E. W. Nelson. Original number 2653.

Well-made skin in good condition; skull perfect.

Neotoma orizabæ Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., IX, p. 122, July 2, 1894.

53653. Skin and skull. Adult male. Mount Orizaba, Puebla, Mexico. April 20, 1893. Collected by E. W. Nelson. Original number 4674.

Well-made skin in good condition; skull perfect, except for absence of last two right upper molars and last left lower molar; right audital bulla disarticulated.

Neotoma orolestes Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., IX, p. 128, July 2, 1894.

$\frac{35906}{45215}$. Skin and skull. Adult male. Saguache Valley, 20 miles west of Saguache, Colorado. August 13, 1892. Collected by J. A. Loring. Original number 482.

Well-made skin in good condition; skull perfect.

Neotoma palatina Goldman. Biological Survey collection.

Proc. Biol. Soc. Wash., XVIII, pp. 27–28, February 2, 1905.

90959. Skin and skull. Adult male. Bolaños, Jalisco, Mexico. September 12, 1897. Collected by E. W. Nelson and E. A. Goldman. Original number 11710.

Well-made skin in fair condition; distal three-fourths of tail missing; skull perfect.

Neotoma parvidens Goldman. Biological Survey collection.

Proc. Biol. Soc. Wash., XVII, p. 81, March 21, 1904.

71586. Skin and skull. Adult female. Juquila, Oaxaca, Mexico. March 2, 1895. Collected by E. W. Nelson and E. A. Goldman. Original number 7587.

Well-made skin in good condition; skull perfect, except for absence of first right lower molar, first right upper molar, first left upper molar, and last left upper molar; parietals fractured.

Neotoma picta Goldman. Biological Survey collection.

Proc. Biol. Soc. Wash., XVII, pp. 79–80, March 21, 1904.

70050. Skin and skull. Adult male. Mountains near Chilpancingo, Guerrero, Mexico. December 20, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 7179.

Well-made skin in good condition; skull perfect.

Neotoma pinetorum Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., VIII, pp. 111–112, July 31, 1893.

$\frac{17692}{24628}$. Skin and skull. Adult female. San Francisco Mountain, Arizona. August 16, 1889. Collected by V. Bailey. Original number 366.

Well-made skin in good condition; skull perfect.

Neotoma micropus planiceps Goldman. Biological Survey coll.

Proc. Biol. Soc. Wash., XVIII, p. 32, February 2, 1905.

82105. Skin and skull. Adult male. Rio Verde, San Luis Potosi, Mexico. January 16, 1897. Collected by E. W. Nelson and E. A. Goldman. Original number 10461.

Well-made skin in good condition; skull perfect, except for absence of last right upper molar.

Neotoma saxamans Osgood. Biological Survey collection.

North Amer. Fauna, No. 19, pp. 33–34, pl. 5, fig. 3, October 6, 1900.

98923. Skin and skull. Adult male. Bennett, British Columbia. June 19. 1899. Collected by W. H. Osgood. Original number 462.

Well-made skin in good condition; skull perfect, except for absence of last left upper molar.

Neotoma macrotis simplex True.

Diagnoses of Some Undescribed Wood Rats (Genus Neotoma) in the National Museum, p. 2, June 27, 1894. (Reprinted in Proc. U. S. Nat. Mus., XVII, No. 1006, p. 354, November 15, 1894.)

=**Neotoma fuscipes simplex** (True). See Miller and Rehn, Proc. Boston Soc. Nat. Hist., XXX, p. 105, December 27, 1901.

$\frac{3661}{3667}$. Skin and skull. Adult male. Old Fort Tejon, in mountains south of Kern Lake, California. Collected by J. Xantus. Original number $\frac{785}{786}$. Catalogued March 24, 1859.

Well-made skin in fair condition; skull perfect, except for a large piece of squamosal broken out on right side.

Neotoma desertorum sola Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., IX, p. 126, July 2, 1894.

$\frac{31516}{43381}$. Skin and skull. Adult male. San Emigdio, Kern County, California. October 24, 1891. Collected by E. W. Nelson. Original number 1369.

Well-made skin in good condition; skull perfect except nasals, which are slightly fractured; angular process of left mandibular ramus broken.

Mr. E. A. Goldman informs us that the skin and the skull in this case are not properly associated, since they belong to different species.

Neotoma ferruginea solitaria Goldman. Biological Survey coll.

Proc. Biol. Soc. Wash., XVIII, p. 31, February 2, 1905.

76908. Skin and skull. Adult male. Nenton, Guatemala. December 17, 1895. Collected by E. W. Nelson and E. A. Goldman. Original number 8813.

Well-made skin in good condition; skull perfect.

Neotoma splendens True.

Diagnoses of Some Undescribed Wood Rats (Genus Neotoma) in the National Museum, p. 1, June 27, 1894. (Reprinted in Proc. U. S. Nat. Mus., XVII, No. 1006, p. 353, November 15, 1894.)

19693. Skin; no record of a skull. Adult male. Marin County, California. November 25, 1887. Purchased from C. K. Worthen. Original number 211. Catalogued September 4, 1891.

Well-made skin in good condition.

Neotoma stephensi Goldman. Biological Survey collection.

Proc. Biol. Soc. Wash., XVIII, pp. 32–33, February 2, 1905.

117466. Skin and skull. Adult female. Hualpai Mountains, Arizona. July 1, 1902. Collected by F. Stephens. Original number 4192.

Well-made skin in good condition; skull perfect.

Neotoma fuscipes streatori Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., IX, p. 124, July 2, 1894.

64439. Skin and skull. Adult male. Carbondale, Amador County, California. April 4, 1894. Collected by C. P. Streator. Original number 3685.

Well-made skin in good condition; skull perfect.

Neotoma tenuicauda Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., VII, pp. 169–170, September 29, 1892.

$\frac{33594}{45629}$. Skin and skull. Adult male. North slope Sierra Nevada de Colima, Jalisco, Mexico; altitude 12,000 feet. April 13, 1892. Collected by E. W. Nelson. Original number 2446.

Well-made skin in good condition; skull perfect, except for broken right zygoma.

Neotoma tropicalis Goldman. Biological Survey collection.

Proc. Biol. Soc. Wash., XVII, pp. 81–82, March 21, 1904.

68593. Skin and skull. Adult male. Totontepec, Oaxaca, Mexico. July 17, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 6468.

Well-made skin in good condition, but with a bare spot on rump; skull perfect, except for absence of last right upper molar and left upper incisor.

Neotoma venusta True.

Diagnoses of Some Undescribed Wood Rats (Genus Neotoma) in the National Museum, p. 2, June 27, 1894. (Reprinted in Proc. U. S. Nat. Mus., XVII, No. 1006, p. 354, November 15, 1894.)

$\frac{21696}{36400}$. Skin and skull. Adult male. Carrizo Creek, San Diego County, California. November 30, 1891. Collected by F. Stephens. Original number 1800. Purchased from C. K. Worthen. Catalogued November 11, 1893.

Well-made skin in good condition; skull perfect.

Neotoma albigula warreni Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XXI, pp. 143–144, June 9, 1908.

151051. Skin and skull. Adult male. Gaumes Ranch, Baca County, Colorado. November 28, 1907. Collected by M. Cary. Original number 1271.

Well-made skin in good condition; skull perfect.

Neotoma leucodon zacatecæ Goldman. Biological Survey coll.

Proc. Biol. Soc. Wash., XVIII, p. 30, February 2, 1905.

90957. Skin and skull. Adult female. Plateado, Zacatecas, Mexico. September 4, 1897. Collected by E. W. Nelson and E. A. Goldman. Original number 11641.

Well-made skin in good condition; skull lacking last left lower molar, right audital bulla, pterygoids, and adjacent parts of brain case; basisphenoid disarticulated; processes of mandibular rami mostly broken away; zygomata broken.

Genus HODOMYS.

Neotoma alleni Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., VII, pp. 168–169, September 29, 1892.

[illegible]odomys alleni (Merriam). See Merriam, Proc. Acad. Nat. Sci. Phila., 1894, 235, September 24, 1894.

$\frac{32709}{44632}$. Skin and skull. Adult male. Manzanillo, Colima, Mexico. January 26, 1892. Collected by E. W. Nelson. Original number 1796.

Well-made skin in good condition; skull perfect.

Hodomys vetulus Merriam. Biological Survey collection.

Proc. Acad. Nat. Sci. Phila., 1894, pp. 236–237, figs. 3c–3d, September 24, 1894.

53656. Skin and skull. Adult male. Tehuacan, Puebla, Mexico. May 8, 1893. Collected by E. W. Nelson Original number 4784.

Well-made skin in good condition; skull perfect, except for broken zygomata, left coronoid, and disarticulated left audital bulla.

Genus TEANOPUS.

Teanopus phenax Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XVI, p. 81, May 29, 1903.

95841. Skin and skull. Adult female. Camoa, Rio Mayo, Sonora, Mexico. November 4, 1898. Collected by E. A. Goldman. Original number 13258.

Well-made skin in good condition; skull perfect.

Genus XENOMYS.

Xenomys nelsoni Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., VII, pp. 161-163, September 29, 1892.

$\frac{33281}{45286}$. Skin and skull. Adult male. Hacienda Magdalena, Colima, Mexico. March 21, 1892. Collected by E. W. Nelson. Original number 2288.

Well-made skin in good condition; skull perfect.

Genus NELSONIA.

Nelsonia goldmani Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XVI, p. 80, May 29, 1903.

125818. Skin and skull. Adult male. Mount Tancitaro, Michoacan, Mexico. February 25, 1903. Collected by E. W. Nelson and E. A. Goldman. Original number 16021.

Well-made skin in good condition: skull perfect, except for slightly injured right auditory meatus.

Nelsonia neotomodon Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XI, pp. 278–279, figs 14–15, December 17, 1897.

90891. Skin and skull. Adult male. Mountains near Plateado, Zacatecas, Mexico. September 3, 1897. Collected by E. W. Nelson and E. A. Goldman. Original number 11625.

Well-made skin in good condition; skull perfect.

Genus NEOTOMODON.

Neotomodon alstoni Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XII, p. 128, April 30, 1898.

50534. Skin and skull. Old male. Nahuatzin, Michoacan, Mexico. October 12, 1892. Collected by E. W. Nelson. Original number 3580.

Well-made skin in good condition; skull perfect.

Neotomodon orizabæ Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XII, p. 129, April 30, 1898.

53486. Skin and skull. Old male. Mount Orizaba, Puebla, Mexico. April 26, 1893. Collected by E. W. Nelson. Original number 4747.

Well-made skin in good condition; skull with mastoid and audital bullæ disarticulated; last right upper molar missing.

Neotomodon perotensis Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XII, p. 129, April 30, 1898.

54398. Skin and skull. Adult female. Cofre de Perote, Vera Cruz, Mexico. May 29, 1893. Collected by E. W. Nelson. Original number 4897.

Well-made skin in good condition; skull perfect, except for broken right zygoma and right parietal.

Genus SIGMODON.

Sigmodon alleni Bailey. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, pp. 112-113, June 2, 1902.

88227. Skin and skull. Adult male. San Sebastian, Jalisco, Mexico. March 15, 1897. Collected by E. W. Nelson and E. A. Goldman. Original number 10708.

Well-made skin in good condition; skull perfect.

Sigmodon alticola Bailey. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, p. 116, June 2, 1902.

68231. Skin and skull. Adult male. Cerro San Felipe, Oaxaca, Mexico. August 24, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 6624.

Well-made skin in good condition; skull perfect, except for broken left audital bulla.

Sigmodon alticola amoles Bailey. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, p. 116, June 2, 1902.

81430. Skin and skull. Adult male. Pinal de Amoles, Queretaro, Mexico. September 18, 1896 (not 1898, as in original description). Collected by E. W. Nelson and E. A. Goldman. Original number 10161.

Well-made skin in good condition, but ears badly damaged by insects; skull with basisphenoid and pterygoid region absent; right zygoma broken; right mandibular condyle, coronoid, and angular processes absent.

Sigmodon berlandieri Baird.

Proc. Acad. Nat. Sci. Phila., VII, p. 333, this paper was reported favorably for publication April 24, 1855.

=**Sigmodon hispidus berlandieri** (Baird). See Bailey, Proc. Biol. Soc. Wash., XV, p. 106, June 2, 1902.

$\frac{566}{1687}$. Skin (lost) and skull. Adult female. Rio Nasas, Coahuila, Mexico. 1853. Collected by Lieut. D. N. Couch, U. S. A. Catalogued March 14, 1855.

The Museum catalogue records that the skin was taken out of alcohol, and that the body is still in alcohol, but neither skin nor body can now be found, and only the injured skull is present. Right zygoma and practically all of the occipital bones and a portion of the right parietal broken away. Right tympanic and periotic are present, but detached from the rest of the skull.

Type not designated by number in the original description, but by referring to Baird's Mammals of North America, page 505, it is seen that the description is based upon the present specimen, designated by number 566. Also see Bailey, *loc. cit.*, page 107.

Sigmodon hispidus eremicus Mearns.

Preliminary Diagnoses of New Mammals of the Genera Sciurus, Castor, Neotoma, and Sigmodon, from the Mexican Border of the United States, p. 4, March 5, 1897. (Reprinted in Proc. U. S. Nat. Mus., XX, No. 1132, p. 504, January 19, 1898.)

60319. Skin and skull. Adult male. Cienega well, 30 miles south of monument No. 204, Mexican boundary line, on the left bank of the Colorado River, in Sonora, Mexico. March 24, 1894. Collected by Dr. E. A. Mearns, U. S. A., and F. X. Holzner. Original number 3367. International Boundary Commission. Catalogued May 8, 1894.

Well-made skin in good condition; skull perfect.

Sigmodon leucotis Bailey. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, p. 115, June 2, 1902.

92001. Skin and skull. Adult female. Valparaiso Mountains, Zacatecas, Mexico. December 2, 1897. Collected by E. W. Nelson and E. A. Goldman. Original number 11812.

Well-made skin in good condition; skull perfect.

Sigmodon hispidus major Bailey. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, pp. 109–110, June 2, 1902.

96275. Skin and skull. Adult male. Sierra de Choix, 50 miles northeast of Choix, Sinaloa, Mexico. October 20, 1898. Collected by E. W. Nelson and E. A. Goldman. Original number 13154.

Well-made skin in good condition; skull perfect.

Sigmodon melanotis Bailey. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, p. 114, June 2, 1902.

50190. Skin and skull. Adult female. Patzcuaro, Michoacan, Mexico. July 15, 1892. Collected by E. W. Nelson. Original number 2834.

Well-made skin in good condition; skull perfect, except for absence of right angular process of mandible and broken right zygoma.

Sigmodon hispidus microdon Bailey. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, pp. 111-112, June 2, 1902.

108467. Skin and skull. Adult male. Puerto Morelos, Yucatan, Mexico. March 13, 1901. Collected by E. W. Nelson and E. A. Goldman. Original number 14581

Well-made skin in good condition; skull perfect.

Sigmodon minimus Mearns.

Proc. U. S. Nat. Mus., XVII, No. 994, p. 130, July 19, 1894.

$\frac{21187}{37291}$. Skin and skull. Adult male. "From upper corner monument, New Mexico, on the Mexican boundary line 100 miles west of the initial monument on the west bank of the Rio Grande" (monument No. 40, 100 miles west of El Paso, Texas). April 26, 1892. Collected by Dr. E. A. Mearns, U. S. A., and F. X. Holzner. Original number 1704. International Boundary Commission. Skin catalogued August 30, 1893; skull, January 5, 1897.

Fairly well made skin in good condition; extreme tip of tail missing and belly a little soiled and torn. Skull has right zygomatic arch completely missing; pterygo-palatal region and both angular processes of mandible somewhat injured.

Sigmodon ochrognathus Bailey. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, p. 115, June 2, 1902.

110333. Skin and skull. Adult female. Chisos Mountains, Texas. June 13, 1901. Collected by V. Bailey. Original number 7681.

Well-made skin in good condition, but right ear imperfect; skull perfect.

Sigmodon hispidus pallidus Mearns.

Preliminary Diagnoses of New Mammals of the Genera Sciurus, Castor, Neotoma, and Sigmodon from the Mexican Border of the United States, p. 4, March 5, 1897. (Reprinted in Proc. U. S. Nat. Mus., XX, No. 1132, p. 504, January 18, 1898.)

$\frac{20103}{35464}$. Skin and skull. Adult male. "From the left bank of the Rio Grande about 6 miles above El Paso, Texas, and opposite the initial monument of the Mexican boundary." February 19, 1892. Collected by Dr. E. A. Mearns, U. S. A., and F. X. Holzner. Original number 1461. International Boundary Commission. Catalogued April 28, 1892.

Well-made skin in good condition; skull with posterior half of cranial cavity broken away, though many fragments are present.

Sigmodon hispidus saturatus Bailey. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, p. 111, June 2, 1902.

99998. Skin and skull. Adult male. Teapa, Tabasco, Mexico. April 5, 1900. Collected by E. W. Nelson and E. A. Goldman. Original number 14108.

Well-made skin in good condition; skull perfect, except for absence of last right lower molar and slight perforation of right audital bulla.

Sigmodon hispidus tonalensis Bailey. Biological Survey collection.

Proc. Biol. Soc. Wash., XV., p. 109, June 2, 1902.

75144. Skin and skull. Adult male. Tonala, Chiapas, Mexico. August 9, 1895. Collected by E. W. Nelson and E. A. Goldman. Original number 8312.

Well-made skin in good condition; skull perfect.

Genus REITHRODONTOMYS.

Reithrodontomys albescens Cary. Biological Survey collection.

Proc. Biol. Soc. Wash., XVI, pp. 53–54, May 6, 1903.

116358. Skin and skull. Adult male. Eighteen miles northwest of Kennedy, Nebraska. October 31, 1901. Collected by M. Cary. Original number 411 (3431x).

Well-made skin in good condition; skull perfect.

Reithrodontomys microdon albilabris Merriam. Biol. Survey coll.

Proc. Wash. Acad. Sci., III, p. 549, November 29, 1901.

68393. Skin and skull. Adult female. Cerro San Felipe, Oaxaca, Mexico. August 25, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 6629.

Well-made skin in good condition; skull perfect.

Reithrodontomys saturatus alticolus Merriam. Biol. Survey coll.

Proc. Wash. Acad. Sci., III, p. 556, November 29, 1901.

68392. Skin and skull. Old male. Cerro San Felipe, Oaxaca, Mexico. August 24, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 6623.

Well-made skin in good condition; skull perfect, except for broken right zygoma.

Reithrodontomys mexicanus aurantius Allen. Biol. Survey coll.

Bull. Amer. Mus. Nat. Hist., VII, pp. 115, 137–138, May 20, 1895.

$\frac{33963}{45998}$. Skin and skull. Adult male. Lafayette, Louisiana, May 24, 1892. Collected by R. J. Thompson. Original number 174.

Well-made skin in good condition; skull perfect, except for broken zygomata.

Reithrodontomys tenuirostris aureus Merriam. Biol. Survey coll.

Proc. Wash. Acad. Sci., III, p. 548, November 29, 1901.

76939. Skin and skull. Adult female. Calel, Guatemala. January 15, 1896. Collected by E. W. Nelson and E. A. Goldman. Original number 9140.

Well-made skin in good condition; skull perfect.

Reithrodontomys chrysopsis Merriam. Biological Survey coll.

Proc. Biol. Soc. Wash., XIII, p. 152, June 13, 1900.

52031. Skin and skull. Adult male. Mount Popocatepetl, Mexico. February 25, 1893. Collected by E. W. Nelson and E. A. Goldman. Original number 4405.

Well-made skin in good condition; skull perfect.

Reithrodontomys saturatus cinereus Merriam. Biol. Survey coll.

Proc. Wash. Acad. Sci., III, p. 556, November 29, 1901.

53623. Skin and skull. Adult male. Chalchicomula, Puebla, Mexico. April 13, 1893. Collected by E. W. Nelson and E. A. Goldman. Original number 4659.

Well-made skin in good condition; skull perfect.

Reithrodontomys colimæ Merriam. Biological Survey collection.

Proc. Wash. Acad. Sci., III, p. 551, November 29, 1901.

$\frac{33671}{45706}$. Skin and skull. Adult male. Sierra Nevada de Colima, Jalisco, Mexico; altitude 12,000 feet. April 13, 1892 (not April 21, 1892, as in original description). Collected by E. W. Nelson and E. A. Goldman. Original number 2447.

Well-made skin in good condition; skull perfect.

Reithrodontomys megalotis deserti Allen. Biological Survey coll.

Bull. Amer. Mus. Nat. Hist., VII, pp. 114, 127–129, May 20, 1895.

$\frac{27720}{35819}$. Skin and skull. Adult female. Oasis Valley, Nye County, Nevada. March 16, 1891. Collected by F. Stephens. Original number 149.

Well-made skin in good condition; skull lacking left half of brain case, including audital bulla.

Reithrodontomys difficilis Merriam. Biological Survey collection.

Proc. Wash. Acad. Sci., III, p. 556, November 29, 1901.

63735. Skin and skull. Adult male. Orizaba, Vera Cruz, Mexico. February 20, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 5868.

Well-made skin in good condition; skull perfect.

Reithrodontomys dorsalis Merriam. Biological Survey collection.

Proc. Wash. Acad. Sci., III, p. 557, November 29, 1901.

77009. Skin and skull. Adult male. Calel, Guatemala. January 14, 1896. Collected by E. W. Nelson and E. A. Goldman. Original number 9112.

Well-made skin in good condition, but tip of tail absent; skull perfect, except for absence of angular processes of mandible.

Reithrodontomys goldmani Merriam. Biological Survey collection.

Proc. Wash. Acad. Sci., III, pp. 552–553, November 29, 1901.

93096. Skin and skull. Adult female. Metlaltoyuca, Puebla, Mexico. February 12, 1898. Collected by E. A. Goldman. Original number 12153.

Well-made skin in good condition; skull perfect.

Reithrodontomys griseoflavus Merriam. Biological Survey coll.

Proc. Wash. Acad. Sci., III, pp. 553–554, November 29, 1901.

82196. Skin and skull. Adult male. Ameca, Jalisco, Mexico. February 9, 1897. Collected by E. W. Nelson and E. A. Goldman. Original number 10501.

Well-made skin in good condition; skull perfect.

Reithrodontomys griseus Bailey. Biological Survey collection.

North Amer. Fauna, No. 25, pp. 106–107, October 24, 1905.

87852. Skin and skull. Adult male. San Antonio, Texas. March 4, 1897. Collected by H. P. Attwater. Original number 1068 (371x).

Well-made skin in good condition; skull perfect.

Reithrodontomys griseoflavus helvolus Merriam. Biol. Survey coll.

Proc. Wash. Acad. Sci., III, p. 554, November 29, 1901.

68387. Skin and skull. Adult female. Oaxaca, Oaxaca, Mexico. August 14, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 6576.

Well-made skin in good condition; skull perfect.

Reithrodontomys hirsutus Merriam. Biological Survey collection.

Proc. Wash. Acad. Sci., III, p. 553, November 29, 1901.

82200. Skin and skull. Old male. Ameca, Jalisco, Mexico. February 15, 1897. Collected by E. W. Nelson and E. A. Goldman. Original number 10537.

Well-made skin in good condition; skull perfect.

Reithrodontomys costaricensis jalapæ Merriam.
Biological Survey collection.

Proc. Wash. Acad. Sci., III, p. 552, November 29, 1901.

108538. Skin and skull. Adult male. Jalapa, Vera Cruz, Mexico. May 10, 1901. Collected by E. W. Nelson and E. A. Goldman. Original number 14712.

Well-made skin in good condition; skull perfect.

Reithrodontomys klamathensis Merriam. Biological Survey coll.

North. Amer. Fauna, No. 16, p. 93, 1899.

95444. Skin and skull. Adult male. Big Spring (or Mayten), Shasta Valley, California. September 18, 1898. Collected by W. H. Osgood. Original number 281.

Well-made skin in good condition; skull perfect.

Reithrodontomys levipes Merriam. Biological Survey collection.

Proc. Wash. Acad. Sci., III, pp. 554–555, November 29, 1901.

88057. Skin and skull. Adult male. San Sebastian, Jalisco, Mexico. March 30, 1897. Collected by E. W. Nelson and E. A. Goldman. Original number 10839.

Well-made skin in good condition; skull perfect.

Reithrodon longicauda Baird. Cotypes.

Mammals of North America, p. 451, 1857.

=**Reithrodontomys longicauda** (Baird). See Allen, Bull. Amer. Mus. Nat. Hist., VII, p. 129, May 21, 1895.

$\frac{1418}{2282}$. Skin and skull. Female. Original number 231.
$\frac{1419}{2283}$. Skin and skull. Male. Original number 232.
$\frac{1583}{2411}$. Skin and skull. Male. Original number 239.
2581 to 2591, both inclusive, alcoholics.

All collected at Petaluma, California, by E. Samuels. $\frac{1418}{2282}$, $\frac{1419}{2283}$, catalogued April 24, 1856; $\frac{1583}{2411}$, June 24, 1856; the alcoholics, April, 1857; 2582, 2584, and 2588 are recorded in the catalogue as "Distributed to C. E. Aiken, June, 1872."

Of these fourteen specimens all that can now be found is the skull of $\frac{1418}{2282}$. The supraoccipital bone has been broken away; the angular process of the left half of the mandible is broken off, and all the molars on the upper right-hand side are lost.

No type is designated and there is absolutely nothing by which any one of Baird's 15 specimens can be picked out as a type. Fourteen of the specimens came from Petaluma, California, and a single one from San Francisco. The former are regarded as cotypes and the type-locality fixed at Petaluma. (See Miller and Rehn, Proc. Bost. Soc. Nat. Hist., XXX, p. 97, December 27, 1901.)

Reithrodon megalotis Baird.

Mammals of North America, p. 451, pl. 84, fig. 4, 1857.

ithrodontomys megalotis (Baird). See Allen, Bull. Amer. Mus. Nat. Hist., V, p. 79, April 23, 1893.

2281. Skull. Between Janos and San Luis Springs, State of Sonora, Mexico, near border of Grant County, New Mexico. Collected by Dr. C. B. Kennerly, under the command of Maj. W. H. Emory, U. S. A. Catalogued November, 1855.

Skull perfect except for loss of both malar bones. There should be a skin, No. 1039, which can not be found.

No type specified, but Baird's description is evidently based upon the above specimen, designated by number. The skull of the above is figured. He had one other specimen, an alcoholic, now lost. His brief diagnosis says, "Hind foot near .70." No. 1039, in the table of measurements, is put down as .68, while 1040, the alcoholic, is .50. Evidently the diagnosis was based on No. 1039. In Report United States and Mexican Boundary Survey, Part 2, page 43, 1859, No. 1039 is alone spoken of.

Reithrodontomys merriami Allen. Biological Survey collection.

Bull. Amer. Mus. Nat. Hist., VII, pp. 114, 119–120, May 20, 1895.

$\frac{32832}{44863}$. Skin and skull. Adult male. Austin Bayou, near Alvin, Brazoria County, Texas. March 15, 1892. Collected by W. Lloyd. Original number 1162.

Well-made skin in good condition; skull lacking posterior half and entire underside of brain case.

Reithrodontomys microdon Merriam. Biological Survey collection.

Proc. Wash. Acad. Sci., III, pp. 548–549, November 29, 1901.

76923. Skin and skull. Adult female. Todos Santos, Guatemala. December 31, 1895. Collected by E. W. Nelson and E. A. Goldman. Original number 8977.

Well-made skin in good condition; skull perfect.

Reithrodon montanus Baird.

Proc. Acad. Nat. Sci., Phila., VII, p. 335, this paper was reported favorably for publication April 24, 1855.

=**Reithrodontomys montanus** (Baird). See Allen, Bull. Amer. Mus. Nat. Hist., V, p. 80, April 28, 1893.

$\frac{441}{1306}$. Mounted skin, and skull. Near the upper end of the San Luis Valley, Saguache County, Colorado. August 29 or 30, 1853–54. Collected by Mr. Kreutzfeldt, on Capt. E. G. Beckwith's expedition from Westport, Missouri, to the Pacific coast in 1853–54. (These data are taken from J. A. Allen, Bull. Amer. Mus. Nat. Hist., VII, pp. 124 and 125, May 21, 1895.) Catalogued January 17, 1855.

Mounted skin in rather poor condition; body doubled up; both fore legs missing. Both hind legs present, but one is detached from the body; tail also detached, but present. Skull with both malars gone, a hole in the left parietal, and the right angular process of the mandible missing; otherwise in good condition.

Type not designated by number in the original description, but the single specimen is referred to by number in Baird's Mammals of North America, page 450.

Reithrodontomys dychei nebrascensis Allen. Biol. Survey coll.

Bull. Amer. Mus. Nat. Hist., VII, pp. 114, 122-123, May 20, 1895.

$\frac{18624}{25426}$. Skin and skull. Adult male. Kennedy, Nebraska. April 19, 1890. Collected by V. Bailey. Original number 1042.

Well-made skin in good condition; skull perfect.

Reithrodontomys colimæ nerterus Merriam. Biological Survey coll.

Proc. Wash. Acad. Sci., III, pp. 551-552, November 29, 1901.

$\frac{33680}{45715}$. Skin and skull. Adult female. Foothill region of Sierra Nevada de Colima, Jalisco, Mexico; altitude, 6,500 feet. April 21, 1892. Collected by E. W. Nelson and E. A. Goldman. Original number 2514.

Well-made skin in good condition, but right hind foot nearly severed from skin ; skull perfect.

Reithrodontomys megalotis obscurus Merriam. Biol. Survey coll.

Proc. Wash. Acad. Sci., III, p. 558, November 29, 1901.

95277. Skin and skull. Adult male. Sierra Madre, near Guadalupe y Calvo, Chihuahua, Mexico. August 26, 1898. Collected by E. W. Nelson and E. A. Goldman. Original number 12900.

Well-made skin in good condition ; skull perfect.

Reithrodontomys orizabæ Merriam. Biological Survey collection.

Proc. Wash. Acad. Sci., III, pp. 550-551, November 29, 1901.

53626. Skin and skull. Adult male. Mount Orizaba, Puebla, Mexico; altitude, 9,500 feet. April 24, 1893. Collected by E. W. Nelson and E. A. Goldman. Original number 4734.

Well-made skin in good condition ; skull perfect.

Reithrodontomys levipes otus Merriam. Biological Survey coll.

Proc. Wash. Acad. Sci., III, p. 555, November 29, 1901.

$\frac{33670}{45705}$. Skin and skull. Adult female. Foothill region of Sierra Nevada de Colima, Jalisco, Mexico; altitude 6,500 feet. April 11. 1892. Collected by E. W. Nelson and E. A. Goldman. Original number 2439.

Well-made skin in good condition; skull perfect.

Reithrodontomys perotensis Merriam. Biological Survey coll.

Proc. Wash. Acad. Sci., III, p. 550, November 29, 1901.

54424. Skin and skull. Adult male. Cofre de Perote, Vera Cruz, Mexico. May 31, 1893. Collected by E. W. Nelson and E. A. dman. Original number 4912.

ell-made skin in good condition; skull perfect.

Reithrodontomys tenuirostris Merriam. Biological Survey coll.

Proc. Wash. Acad. Sci., III, pp. 547–548, November 29, 1901.

76919. Skin and skull. Adult male. Todos Santos, Guatemala. December 29, 1895. Collected by E. W. Nelson and E. A. Goldman. Original number 8917.

Well-made skin in good condition; skull perfect.

Reithrodontomys levipes toltecus Merriam. Biological Survey coll.

Proc. Wash. Acad. Sci., III, pp. 555–556, November 29, 1901.

50746. Skin and skull. Adult female. Tlalpam, Federal District, Mexico. December 1, 1892. Collected by E. W. Nelson and E. A. Goldman. Original number 3935.

Well-made skin in good condition; skull perfect.

Reithrodontomys chrysopsis tolucæ Merriam. Biol. Survey coll.

Proc. Wash. Acad. Sci., III, p. 549, November 29, 1901.

55895. Skin and skull. Adult female. North slope Volcan Toluca, Mexico, Mexico; altitude 11,500 feet. September 10, 1893. Collected by E. W. Nelson and E. A. Goldman. Original number 5454.

Well-made skin in good condition; skull perfect.

Reithrodontomys megalotis zacatecæ Merriam. Biol. Survey coll.

Proc. Wash. Acad. Sci., III, p. 557, November 29, 1901.

91910. Skin and skull. Adult female. Valparaiso Mountains, Zacatecas, Mexico. December 6, 1897. Collected by E. W. Nelson and E. A. Goldman. Original number 11859.

Well-made skin in good condition; skull perfect, except for broken zygomata.

Genus ORYZOMYS.

Oryzomys albiventer Merriam. Biological Survey collection.

Proc. Wash. Acad. Sci., III, pp. 279–280, July 26, 1901.

82236. Skin and skull. Adult male. Ameca, Jalisco, Mexico. February 6, 1897. Collected by E. W. Nelson and E. A. Goldman. Original number 10478.

Well-made skin in good condition; skull perfect, except for broken right mandibular ramus.

Oryzomys angusticeps Merriam. Biological Survey collection.

Proc. Wash. Acad. Sci., III, p. 292, July 26, 1901.

76816. Skin and skull. Adult male. Volcan Santa Maria, Guatemala. January 22, 1896. Collected by E. W. Nelson and E. A. Goldman. Original number 9190.

Well-made skin in good condition; skull perfect, except for absence of left audital bulla.

Oryzomys crinitus aztecus Merriam. Biological Survey collection.

Proc. Wash. Acad. Sci., III, pp. 282–283, July 26, 1901.

51173. Skin and skull. Adult male. Yautepec, Morelos, Mexico. January 16, 1893. Collected by E. W. Nelson and E. A. Goldman. Original number 4290.

Well-made skin in good condition; skull perfect, except for broken upper incisors and interorbital region.

Oryzomys chapmani caudatus Merriam. Biological Survey coll.

Proc. Wash. Acad. Sci., III, p. 289, July 26, 1901.

68641. Skin and skull. Adult male. Comaltepec, Oaxaca, Mexico. July 31, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 6516.

Well-made skin in good condition; skull perfect.

Oryzomys cozumelæ Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XIV, pp. 103–104, July 19, 1901.

108462. Skin and skull. Adult male. Cozumel Island, Yucatan, Mexico. April 8, 1901. Collected by E. W. Nelson and E. A. Goldman. Original number 14666.

Well-made skin in good condition; skull perfect.

Oryzomys crinitus Merriam. Biological Survey collection.

Proc. Wash. Acad. Sci., III, pp. 281–282, July 26, 1901.

50182. Skin and skull. Adult male. Tlalpam, Federal District, Mexico. November 30, 1892. Collected by E. W. Nelson and E. A. Goldman. Original number 3905.

Well-made skin in good condition; skull perfect.

Oryzomys chapmani dilutior Merriam. Biological Survey coll.

Proc. Wash. Acad. Sci., III, p. 290, July 26, 1901.

93124. Skin and skull. Adult male. Huauchinango, Puebla, Mexico. January 10, 1898. Collected by E. W. Nelson and E. A. Goldman. Original number 12040.

Well-made skin in good condition; skull perfect.

Oryzomys natator floridanus Merriam. Biological Survey coll.

Proc. Wash. Acad. Sci., III, p. 277, July 26, 1901.

=**Oryzomys palustris coloratus** (Bangs). See Rhoads, Amer. Nat., XXXVI, p. 663, August, 1902.

71349. Skin and skull. Adult male. Everglade, Monroe County, Florida. March 29, 1895. Collected by J. A. Loring. Original number 2819.

Well-made skin in good condition; skull perfect, except for absence of last upper molars and last two right lower molars.

Oryzomys goldmani Merriam. Biological Survey collection.

Proc. Wash. Acad. Sci., III, pp. 288–289, July 26, 1901.

78110. Skin and skull. Adult female. Coatzacoalcos, Vera Cruz, Mexico. April 11, 1896. Collected by E. W. Nelson and E. A. Goldman. Original number 9511.

Well-made skin in good condition; skull perfect.

Oryzomys hylocetes Merriam. Biological Survey collection.

Proc. Wash. Acad. Sci., III, p. 291, July 26, 1901.

77605. Skin and skull. Old male. Chicharras, Chiapas, Mexico. February 14, 1896. Collected by E. W. Nelson and E. A. Goldman. Original number 9306.

Well-made skin in good condition; skull perfect.

Oryzomys medius Robinson and Lyon.

Proc. U. S. Nat. Mus., XXIV, No. 1246, p. 142, October 3, 1901.

105405. Skin and skull. Young adult male. San Julian, 8 miles east of La Guaira, Venezuela. August 8, 1900. Collected by Maj. Wirt Robinson, U. S. A. Original number 1655. Catalogued May 8, 1901.

Well-made skin in good condition, except for small loss of hair on nape; skull perfect.

Oryzomys rostratus megadon Merriam. Biological Survey coll.

Proc. Wash. Acad. Sci., III, p. 294, July 26, 1901.

99978. Skin and skull. Old male. Teapa, Tabasco, Mexico. March 24, 1900. Collected by E. W. Nelson and E. A. Goldman. Original number 14062.

Well-made skin in good condition; skull perfect, except for absence of angular process of right mandibular ramus.

Oryzomys nelsoni Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XII, p. 15, January 27, 1898.

89200. Skin and skull. Adult male. Maria Madre Island, Tres Marias Islands, Mexico. May 13, 1897. Collected by E. W. Nelson and E. A. Goldman. Original number 11022.

Well-made skin in good condition; skull perfect.

Oryzomys palatinus Merriam. Biological Survey collection.

Proc. Wash. Acad. Sci., III, pp. 290–291, July 26, 1901.

99977. Skin and skull. Adult female. Teapa, Tabasco, Mexico. April 1, 1900. Collected by E. W. Nelson and E. A. Goldman. Original number 14080.

Well-made skin in good condition; skull perfect, except for absence of last right upper molar and left occipital condyle.

Oryzomys mexicanus peragrus Merriam. Biological Survey coll.

Proc. Wash. Acad. Sci., III, pp. 283–284, July 26, 1901.

82119. Skin and skull. Young adult male. Rio Verde, San Luis Potosi, Mexico. January 8, 1897. Collected by E. W. Nelson and E. A. Goldman. Original number 10398.

Well-made skin in good condition; skull perfect.

Mus peruvianus Peale. See page 289.

Oryzomys rhabdops Merriam. Biological Survey collection.

Proc. Wash. Acad. Sci., III, pp. 291–292, July 26, 1901.

76813. Skin and skull. Adult male. Calel, Guatemala. January 15, 1896. Collected by E. W. Nelson and E. A. Goldman. Original number 9135.

Well-made skin in good condition; skull perfect.

Oryzomys richmondi Merriam. Biological Survey collection.

Proc. Wash. Acad. Sci., III, p. 284, July 26, 1901.

$\frac{36340}{48706}$. Skin and skull. Adult male. Escondido River, 50 miles above Bluefields, Nicaragua. June 21, 1892. Collected by Dr. C. W. Richmond. Original number 63.

Well-made skin in good condition; skull perfect.

Oryzomys rostratus Merriam. Biological Survey collection.

Proc. Wash. Acad. Sci., III, pp. 293–294, July 23, 1901.

93112. Skin and skull. Old male. Metlaltoyuca, Puebla, Mexico. February 5, 1898. Collected by E. W. Nelson and E. A. Goldman. Original number 12130.

Well-made skin in good condition; skull perfect.

Oryzomys jalapæ rufinus Merriam. Biological Survey collection.

Proc. Wash. Acad. Sci., III, p. 285, July 26, 1901.

65499. Skin and skull. Adult female. Catemaco, Vera Cruz, Mexico. April 27, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 6112.

Well-made skin in good condition; skull perfect.

Oryzomys rufus Merriam. Biological Survey collection.

Proc. Wash. Acad. Sci., III, p. 287, July 26, 1901.

91404. Skin and skull. Old female. Santiago, Tepic, Mexico. June 20, 1897. Collected by E. W. Nelson and E. A. Goldman. Original number 11232.

Well-made skin in good condition; skull perfect, except for absence of last two upper molars and of basisphenoid and pterygoid processes, and injured nasal and supraoccipital.

Oryzomys chapmani saturatior Merriam. Biological Survey coll.

Proc. Wash. Acad. Sci., III, p. 290, July 28, 1901.

76183. Skin and skull. Adult female. Tumbala, Chiapas, Mexico. October 23, 1895. Collected by E. W. Nelson and E. A. Goldman. Original number 8574.

Well-made skin in good condition; skull perfect, except for absence of angular processes of mandible.

Oryzomys talamancæ Allen.

Proc. U. S. Nat. Mus., XIV, No. 850, p. 193, July 24, 1891.

$\frac{12222}{22742}$. Skin and skull. Adult male. Talamanca, Costa Rica. 1874. Collected by Prof. W. M. Gabb. Original number 99. Catalogued November 19, 1874.

Specimen in good state of preservation; in February, 1902, made into a fair study skin. Left hind leg missing; tail not skinned out and from 2 to 3 cm. of the tip without epidermis. Skull nearly perfect. Pterygoids injured, and angular and coronoid processes of right half of mandible broken. In the original description Dr. Allen remarks there is no lower jaw. The present lower jaw was found in the same vial with the rest of the skull. It was not numbered, however, so there is some doubt as to its belonging to the specimen.

Oryzomys teapensis Merriam. Biological Survey collection.

Proc. Wash. Acad. Sci., III, p. 286, July 26, 1901.

99973. Skin and skull. Young adult male. Teapa, Tabasco, Mexico. April 4, 1900. Collected by E. W. Nelson and E. A. Goldman. Original number 14100.

Well-made skin in good condition; skull perfect, except for absence of left occipital condyle.

Oryzomys yucatanensis Merriam. Biological Survey collection.

Proc. Wash. Acad. Sci., III, pp. 294–295, July 26, 1901.

108139. Skin and skull. Young adult male. Chichenitza, Yucatan, Mexico. February 9, 1901. Collected by E. W. Nelson and E. A. Goldman. Original number 14527.

Well-made skin in good condition; skull perfect.

Oryzomys zygomaticus Merriam. Biological Survey collection.

Proc. Wash. Acad. Sci., III, pp. 285–286, July 26, 1901.

76794. Skin and skull. Adult male. Nenton, Guatemala. December 15, 1895. Collected by E. W. Nelson and E. A. Goldman. Original number 8798.

Well-made skin in good condition; skull perfect.

Genus ONYCHOMYS.

Onychomys leucogaster albescens Merriam. Biol. Survey coll.

Proc. Biol. Soc. Wash., XVII, pp. 124–125, June 9, 1904.

50040. Skin and skull. Adult female. Samalayuca, Chihuahua, Mexico. December 12, 1892. Collected by C. P. Streator. Original number 2399.

Well-made skin in good condition; skull perfect.

Onychomys torridus arenicola Mearns.

Preliminary Diagnoses of New Mammals from the Mexican Border of the United States, p. 3, May 25, 1896. (Reprinted in Proc. U. S. Nat. Mus., XIX, No. 1103, p. 139, December 21, 1896.)

$\frac{20081}{36483}$. Skin and skull. Adult male. Rio Grande, about 6 miles above El Paso, Texas. February 29, 1896. Collected by Dr. E. A. Mearns, U. S. A., and F. X. Holzner. Original number 1528. International Boundary Commission. Catalogued April 28, 1892.

Well-made skin in good condition; skull perfect.

Onychomys leucogaster brevicaudus Merriam. Biol. Survey coll.

North Amer. Fauna, No. 5, pp. 52–53, fig. 2, July 30, 1891.

$\frac{23086}{30632}$. Skin and skull. Adult male. Blackfoot, Bingham County, Idaho. July 15, 1890. Collected by V. Bailey and Dr. B. H. Dutcher, U. S. A. Original number 1442.

Well-made skin in good condition; skull lacking basioccipital, supraoccipital, interparietal, and part of parietals.

Onychomys torridus canus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XVII, p. 124, June 9, 1904.

90843. Skin and skull. Adult female. San Juan Capistrano, Zacatecas, Mexico. August 23, 1897. Collected by E. W. Nelson and E. A. Goldman. Original number 11574.

Well-made skin in good condition, except for bare patch on abdomen; skull perfect.

Onychomys fuliginosus Merriam. Biological Survey collection.

North Amer. Fauna, No. 3, pp. 59–61, September 4, 1890.

$\frac{17887}{24908}$. Skin and skull. Adult female. Black Tank lava beds, northeast of San Francisco Mountain, Arizona. September 27, 1889. Collected by Dr. C. Hart Merriam and V. Bailey. Original number 547.

Well-made skin in good condition; skull perfect.

Onychomys torridus perpallidus Mearns.

Preliminary Diagnoses of New Mammals from the Mexican Border of the United States, p. 4, May 25, 1896. (Reprinted in Proc. U. S. Nat. Mus., XIX, No. 1103, p. 140, December 21, 1896.)

60174. Skin and skull. Adult female. Left bank of the Colorado River, at monument 204, Mexican boundary line. March 27, 1894. Collected by Dr. E. A. Mearns, U. S. A., and F. X. Holzner. Original number 3301. International Boundary Commission. Catalogued May 7, 1894.

Well-made skin in good condition; skull perfect, except for piece out of left zygoma.

Hesperomys (Onychomys) torridus Coues.

Proc. Acad. Nat. Sci. Phila., 1874, p. 183, December 15, 1874.

=**Onychomys torridus** (Coues). See Merriam, North Amer. Fauna, No. 2, p. 3, October 30, 1889.

9886. Skin without skull. Camp Grant, Graham County, Arizona. June 10, 1867. Collected by Dr. E. Palmer. Catalogued January, 1872.

Skin taken out of alcohol (according to Coues), well preserved, but poorly made up. No record of a skull.

Onychomys torridus tularensis Merriam. Biological Survey coll.

Proc. Biol. Soc. Wash., XVII, p. 123, June 9, 1904.

$\frac{29711}{41786}$. Skin and skull. Adult female. Bakersfield, California. July 19, 1891. Collected by Dr. A. K. Fisher. Original number 792.

Well-made skin in good condition; skull perfect.

Onychomys torridus yakiensis Merriam. Biological Survey coll.

Proc. Biol. Soc. Wash., XVII, p. 124, June 9, 1904.

95855. Skin and skull. Adult female. Camoa, Rio Mayo, Sonora, Mexico. October 28, 1898. Collected by E. A. Goldman. Original number 13158.

Well-made skin in good condition; skull perfect, except for absence of last right upper molar; audital bullæ each with a large perforation.

Genus PEROMYSCUS.

Hesperomys (Vesperimus) affinis Allen.

Proc. U. S. Nat. Mus., XIV, No. 850, p. 195, July 24, 1891.

=**Peromyscus affinis** (Allen). See Allen and Chapman, Bull. Amer. Mus. Nat. Hist., IX, p. 7, February 23, 1897.

$\frac{9382}{8665}$. Skin and skull (latter lost). Adult female. Barrio, Tehauntepec, Mexico. October 30, 1868. Collected by Prof. F. Sumichrast. Original number 23. Catalogued April 10, 1869.

Skin fairly well preserved, rather poorly made up; tail not skinned out; right foot present, but broken off from body. Skull can not be found.

Type designated by number. In the description the figures read 7382, but it is an error for 9382.

Peromyscus allex Osgood. Biological Survey collection.

Proc. Biol. Soc. Wash., XVII, pp. 76–77, March 21, 1904.

$\frac{33422}{45452}$. Skin and skull. Adult female. Colima, Colima, Mexico. March 7, 1892. Collected by E. W. Nelson. Original number 2029.

Well-made skin in good condition; skull perfect.

Peromyscus allophylus Osgood. Biological Survey collection.

Proc. Biol. Soc. Wash., XVII, p. 71, March 21, 1904.

77657. Skin and skull. Adult female. Huehuetan, Chiapas, Mexico. February 21, 1896. Collected by E. W. Nelson and E. A. Goldman. Original number 9352.

Well-made skin in good condition; skull perfect.

Peromyscus altilaneus Osgood. Biological Survey collection.

Proc. Biol. Soc. Wash., XVII, pp. 74–75, March 21, 1904.

76856. Skin and skull. Adult male. Todos Santos, Guatemala. December 30, 1895. Collected by E. W. Nelson and E. A. Goldman. Original number 8942.

Well-made skin in good condition; skull perfect.

Peromyscus amplus Osgood. Biological Survey collection.

Proc. Biol. Soc. Wash., XVII, pp. 62–63, March 21, 1904.

70158. Skin and skull. Adult female. Coixtlahuaca, Oaxaca, Mexico. November 12, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 7033.

Well-made skin in good condition; skull perfect.

Peromyscus banderanus angelensis Osgood. Biol. Survey coll.

Proc. Biol. Soc. Wash., XVII, p. 69, March 21, 1904..

71442. Skin and skull. Adult female. Puerto Angel, Oaxaca, Mexico. March 13, 1895. Collected by E. W. Nelson and E. A. Goldman. Original number 7642.

Well-made skin in good condition; skull perfect.

Peromyscus eremicus arenarius Mearns.

Preliminary Diagnoses of New Mammals from the Mexican Border of the United States, p. 2, May 25, 1896. (Reprinted in Proc. U. S. Nat. Mus., XIX, No. 1103, p. 138, December 21, 1896.)

$\frac{20018}{36413}$. Skin and skull. Adult male. Rio Grande, about 6 miles from El Paso, Texas. February 25, 1892. Collected by Dr. E. A. Mearns, U. S. A., and F. X. Holzner. Original number 1513. International Boundary Commission. Catalogued April 28, 1892.

Well-made skin in good condition; skull perfect.

Peromyscus auritus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XII, pp. 119–120, April 30, 1898.

68438. Skin and skull. Old female. Mountains 15 miles west of Oaxaca, Oaxaca, Mexico. September 17, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 6795.

Well-made skin in good condition; skull perfect.

Hesperomys austerus Baird.

Proc. Acad. Nat. Sci. Phila., VII, p. 336, this paper was reported favorably for publication April 24, 1855.

= **Peromyscus austerus (Baird).** See Bangs, Amer. Nat., XXXI, p. 75, January, 1897.

$\frac{1278}{364}$. Skin (lost) and skull. Young adult. Steilacoom, Washington. Probably January 20, 1854. Collected by Dr. George Suckley. Catalogued January 4, 1855.

Skin said to have been mounted; can not be found. Skull much broken; most of mandible present, and most of rostrum, both the upper tooth rows, and a small portion of the cranium. Parts of the skull have a charred appearance.

No type designated. Baird (Mammals of North America, p. 467, 1857) lists 8 specimens as positively *austerus:* No. 229 from Spokane Plain, and nos. 363, 364, 365, 371, 916, 1964 and 2576 from Steilacoom, Washington. Since Steilacoom is the first locality mentioned in the original description, and since seven-eighths of the specimens came from there, Steilacoom should be chosen as the type-locality. (See Allen, Bull. Amer. Mus. Nat. Hist., V, 1893, p. 192.) Miller and Rehn (Proc. Boston Soc. Nat. Hist., XXX, p. 69, December 27, 1901) erroneously give Spokane Plain as the type-locality. Of the specimens coming from Steilacoom only the first four were catalogued at the time the original description appeared. The other three were catalogued later in the same year or in the next year. Evidently they were not in Baird's hands when the original description was prepared and they can not be considered as part of the original material. The first four may properly be considered as the original material. Of these no. 364, as measured by Baird in 1857, agrees very closely (hind foot identical) with the measurements given in the original description and may be chosen as the type. All of these four specimens are represented in the collection by imperfect skulls only. The skins are said to have been mounted. They could not be found in 1893. (See Allen, *loc. cit.*)

No. 1964 bears one of Dr. Coues's labels marked "Type of *H. austerus* Baird=*leucopus*," in what is evidently Dr. Coues's handwriting. In Table 16 on page 74, Monographs of North American Rodentia, 1877, Dr. Coues gives no. 1964 as "typical of '*austerus*.'" As this specimen was collected after the original description appeared, it obviously can not be considered the type.

Peromyscus yucatanicus badius Osgood. Biological Survey coll.

Proc. Biol. Soc. Wash., XVII, pp. 70–71, March 21, 1904.

108016. Skin and skull. Adult female. Apazote, Campeche, Mexico. December 28, 1900. Collected by E. W. Nelson and E. A. Goldman. Original number 14377.

Well-made skin in good condition; skull perfect.

Peromyscus sonoriensis blandus Osgood. **Biological Survey coll.**

Proc. Biol. Soc. Wash., XVII, p. 56, March 21, 1904.

57635. Skin and skull. Adult female. **Escalon, Chihuahua, Mexico.** November 27, 1893. Collected by E. A. Goldman. **Original number 166.**

Well-made skin in good condition; skull perfect.

Hesperomys boylii Baird.

Proc. Acad. Nat. Sci., Phila., VII, p. 335, this paper was reported favorably for publication April 24, 1855.

=**Peromyscus boylii** (Baird). See Mearns, Preliminary Diagnoses of New Mammals from the Mexican Border of the United States, p. 3, May 25, 1896. (Reprinted in Proc. U. S. Nat. Mus., XIX, No. 1130, p. 139, December 21, 1896.)

$\frac{356}{1276}$. Mounted skin, and skull and tail vertebræ. **Along the middle fork of the American River, between Placer and Eldorado counties, California.** Collected by Dr. C. C. Boyle. **Skin catalogued** January 4, 1855; skull, December 20, 1854.

Skin mounted and in wretched condition; skull complete except for the right malar and most of the left zygomatic arch.

Type not designated by number. It is referred to in the original description as "collected on the middle fork of the American River, California, by Dr. C. C. Boyle." In the list of specimens of *Hesperomys boylii* in Baird's Mammals, No. $\frac{356}{1276}$ is the only one with the above data and is consequently to be taken as the type.

Peromyscus bullatus Osgood. Biological Survey collection.

Proc. Biol. Soc. Wash., XVII, p. 63, March 21, 1904.

54405. Skin and skull. Adult female. **Perote, Vera Cruz, Mexico.** June 3, 1893. Collected by E. W. Nelson and E. A. Goldman. Original number 4932.

Well-made skin in good condition; skull perfect.

Hesperomys campestris Le Conte.

Proc. Acad. Nat. Sci. Phila., VI, p. 413, this paper was reported favorably for publication October 25, 1853.

= **Peromyscus leucopus noveboracensis** (Fischer).

4726. Skin (no history of a skull). Immature. New Jersey. Major J. E. Le Conte, U. S. A. Catalogued April 13, 1861.

Skin in wretched shape and condition. Le Conte's original specimens were in alcohol, and the specimen is evidently an attempt at making a skin from one of them. Large areas of hair have slipped from the back and belly.

Type not designated by number. Coues is the only authority for considering it the type. On page 51 of Monographs of North American Rodentia he refers to it as the type, and again on page 62. In addition, the specimen is entered in the Museum catalogue as "*Hesperomys campestris*" and as coming from Le

April 13, 1861. One of the old labels on the specimen has written on the "Type of the species as described Pr. A. N. S., VI, 1853, 413."

Peromyscus canus Mearns.

Preliminary Diagnoses of New Mammals from the Mexican Border of the United States, p. 3, March 25, 1896. (Reprinted in Proc. U. S. Nat. Mus., XVIII, No. 1075, p. 445, May 23, 1896.)

=**Peromyscus texanus** (Woodhouse). See Mearns, Bull. U. S. Nat. Mus., No. 56, pt. 1, p. 404, April 13, 1907.

$\frac{21109}{37096}$. Skin and skull. Adult female. Fort Clark, Kinney County, Texas. January 13, 1893. Collected by Dr. E. A. Mearns, U. S. A. Original number 2208. International Boundary Commission. Skin catalogued August 29, 1893; skull, February 27, 1896.

Well-made skin in good condition; skull perfect.

Peromyscus texanus castaneus Osgood. Biological Survey coll.

Proc. Biol. Soc. Wash., XVII, pp. 58–59, March 21, 1904.

107980. Skin and skull. Adult male. Yohaltun, Campeche, Mexico. December 19, 1900. Collected by E. W. Nelson and E. A. Goldman. Original number 14283.

Well-made skin in good condition; skull perfect.

Peromyscus texanus clementis Mearns.

Preliminary Diagnoses of New Mammals from the Mexican Border of the United States, p. 4, March 25, 1896. (Reprinted in Proc. U. S. Nat. Mus., XVIII, No. 1075, p. 446, May 23, 1896.)

61117. Skin and skull. Adult male. San Clemente Island, Pacific Ocean, California. August 27, 1894. Collected by Dr. E. A. Mearns, U. S. A. Original number 3819. International Boundary Commission. Catalogued November 17, 1894.

Well-made skin in good condition; skull perfect.

Hesperomys cognatus Le Conte. Cotypes.

Proc. Acad. Nat. Sci. Phila., VII, p. 442, this paper was reported favorably for publication December 25, 1855.

=**Peromyscus gossypinus** (Le Conte).

4708 and 4709. Poorly made skins but well preserved; skulls inside. Collected by Major J. E. Le Conte, U. S. A. The locality given in the original description is Georgia and South Carolina. Catalogued April 13, 1861.

The specimens are considered cotypes on Dr. Coues's authority. In the synonymy of *Hesperomys leucopus* on page 51, Monographs of North American Rodentia, he gives "*Hesperomys cognatus* Le Conte, Proc. Acad. Nat. Sci. Phila., VII, 1855, p. 442 (Southern States; types, Nos. 4708, 4709, Mus. Smiths.)."

Peromyscus comptus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XII, p. 120, April 30, 1898.

70191. Skin and skull. Adult male. Mountains near Chilpancingo, Guerrero, Mexico. December 24, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 7266.

Well-made skin in good condition; skull perfect, except for broken left zygoma.

Peromyscus melanophrys consobrinus Osgood. Biol. Survey coll.

Proc. Biol. Soc. Wash., XVII, p. 66, March 21, 1904.

79626. Skin and skull. Adult female. Berriozabal, Zacatecas, Mexico. July 10, 1896. Collected by E. W. Nelson and E. A. Goldman. Original number 9818.

Well-made skin in good condition; skull perfect.

Peromyscus cozumelæ Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XIV, p. 103, July 19, 1901.

108449. Skin and skull. Adult male. Cozumel Island, Yucatan, Mexico. April 11, 1901. Collected by E. W. Nelson and E. A. Goldman. Original number 14686.

Well-made skin in good condition; skull perfect.

Hesperomys crinitus Merriam. Biological Survey collection.

North Amer. Fauna, No. 5, pp. 53–54, fig. 3, July 30, 1891.

= **Peromyscus crinitus** (Merriam). See Bangs, Proc. New Eng. Zool. Club, I, p. 67, July 31, 1899.

$\frac{24255}{31069}$. Skin and skull. Adult male. Shoshone Falls, Idaho. October 10, 1890. Collected by Dr. C. Hart Merriam and V. Bailey. Original number 1945.

Well-made skin in good condition; skull perfect.

Peromyscus zarhynchus cristobalensis Merriam.
Biological Survey collection.

Proc. Biol. Soc. Wash., XII, pp. 117–118, April 30, 1898.

76109. Skin and skull. Adult female. San Cristobal, Chiapas, Mexico. October 2, 1895. Collected by E. W. Nelson and E. A. Goldman. Original number 8536.

Well-made skin in good condition; skull perfect.

Peromyscus attwateri eremicoides Osgood. Biological Survey coll.

Proc. Biol. Soc. Wash., XVII, p. 60, March 21, 1904.

=**Peromyscus pectoralis eremicoides** (Osgood). See Bailey, Proc. Biol. Soc. Wash., XIX, p. 57, May 1, 1906.

57729. Skin and skull. Adult male. Mapimi, Durango, Mexico. December 15, 1893. Collected by E. A. Goldman. Original number 235.

Well-made skin in good condition; skull perfect.

Hesperomys eremicus Baird. Cotypes.

Mammals of North America, p. 479, 1857.

=**Peromyscus eremicus** (Baird). See Allen, Bull. Amer. Mus. Nat. Hist., VII, p. 226, June 29, 1895.

$\frac{1681}{410}$. Skin (lost) and skull. Male. Fort Yuma, California. 1853. Received from Maj. G. H. Thomas, U. S. A. Catalogued June

24, 1856. Both halves of mandible present and a portion of the left upper maxilla, all with some of the teeth out, which are still present, however.

2574. Data as above, preserved in alcohol; specimen lost. Catalogued May, 1857.

$\frac{2575}{3803}$. In alcohol; skull removed. Female. Data as above. Specimen in good condition except for some shedding of hair about the flanks. The skull was removed in May, 1902, and is in good condition. Alcoholic catalogued May, 1857; skull, May 26, 1902.

Baird's description is based upon six specimens, three from Fort Yuma, California, and three from "Colorado bottom, Cal." There is nothing to indicate that any one specimen was regarded as more typical than any of the others. It seems best, however, to restrict the cotypes to the three first mentioned as from Fort Yuma, since this is a definite locality; and to consider the three from "Colorado bottom" as paratypes. Much of the description is based upon details of the soles of the feet, which could be made out more readily in alcoholic specimens. Two of the Fort Yuma specimens were in alcohol, while all the "Colorado bottom" specimens were skins.

Peromyscus spicilegus evides Osgood. Biological Survey coll.

Proc. Biol. Soc. Wash., XVII, p. 64, March 21, 1904.

71426. Skin and skull. Adult male. Juquila, Oaxaca, Mexico. February 28, 1895. Collected by E. W. Nelson and E. A. Goldman. Original number 7572.

Well-made skin in good condition; skull perfect.

Peromyscus felipensis Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XII, pp. 122–123, April 30, 1898.

68409. Skin and skull. Adult male. Cerro San Felipe, Oaxaca, Mexico. August 22, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 6611.

Well-made skin in good condition; skull perfect.

Peromyscus sonoriensis fulvus Osgood. Biological Survey coll.

Proc. Biol. Soc. Wash., XVII, p. 57, March 21, 1904.

68655. Skin and skull. Adult male. Oaxaca, Oaxaca, Mexico. June 12, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 6277.

Well-made skin in good condition; skull perfect.

Hesperomys gambelii Baird. Cotypes.

Mammals of North America, p. 464, 1857.

=**Peromyscus texanus gambelii** (Baird). See Allen, Bull. Amer. Mus. Nat. Hist., VIII, p. 267, December 4, 1896.

$\frac{368}{1282}$. Skin and skull, and tail vertebræ. $\frac{369}{1283}$. Skin (lost) and skull, and tail vertebræ. Monterey, California. Collected by Lieut. W. P. Trowbridge, U. S. A. Skins catalogued January 4, 1854; skulls, January 6, 1855.

Peromyscus melanophrys consobrinus Osgood. Biol. Survey coll.

Proc. Biol. Soc. Wash., XVII, p. 66, March 21, 1904.

79626. Skin and skull. Adult female. Berriozabal, Zacatecas, Mexico. July 10, 1896. Collected by E. W. Nelson and E. A. Goldman. Original number 9818.

Well-made skin in good condition; skull perfect.

Peromyscus cozumelæ Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XIV, p. 103, July 19, 1901.

108449. Skin and skull. Adult male. Cozumel Island, Yucatan, Mexico. April 11, 1901. Collected by E. W. Nelson and E. A. Goldman. Original number 14686.

Well-made skin in good condition; skull perfect.

Hesperomys crinitus Merriam. Biological Survey collection.

North Amer. Fauna, No. 5, pp. 53–54, fig. 3, July 30, 1891.

= **Peromyscus crinitus** (Merriam). See Bangs, Proc. New Eng. Zool. Club, I, p. 67, July 31, 1899.

$\frac{24255}{31669}$. Skin and skull. Adult male. Shoshone Falls, Idaho. October 10, 1890. Collected by Dr. C. Hart Merriam and V. Bailey. Original number 1945.

Well-made skin in good condition; skull perfect.

Peromyscus zarhynchus cristobalensis Merriam.
Biological Survey collection.

Proc. Biol. Soc. Wash., XII, pp. 117–118, April 30, 1898.

76109. Skin and skull. Adult female. San Cristobal, Chiapas, Mexico. October 2, 1895. Collected by E. W. Nelson and E. A. Goldman. Original number 8536.

Well-made skin in good condition: skull perfect.

Peromyscus attwateri eremicoides Osgood. Biological Survey coll.

Proc. Biol. Soc. Wash., XVII, p. 60, March 21, 1904.

= **Peromyscus pectoralis eremicoides** (Osgood). See Bailey, Proc. Biol. Soc. Wash., XIX, p. 57, May 1, 1906.

57729. Skin and skull. Adult male. Mapimi, Durango, Mexico. December 15, 1893. Collected by E. A. Goldman. Original number 235.

Well-made skin in good condition; skull perfect.

Hesperomys eremicus Baird. Cotypes.

Mammals of North America, p. 479, 1857.

= **Peromyscus eremicus** (Baird). See Allen, Bull. Amer. Mus. Nat. Hist., VII, p. 226, June 29, 1895.

$\frac{1581}{2410}$. Skin (lost) and skull. Male. Fort Yuma, California. 1853. Received from Maj. G. H. Thomas, U. S. A. Catalogued June

24, 1856. Both halves of mandible present and a portion of the left upper maxilla, all with some of the teeth out, which are still present, however.

2574. Data as above, preserved in alcohol; specimen lost. Catalogued May, 1857.

$\frac{2575}{38003}$. In alcohol; skull removed. Female. Data as above. Specimen in good condition except for some shedding of hair about the flanks. The skull was removed in May, 1902, and is in good condition. Alcoholic catalogued May, 1857; skull, May 26, 1902.

Baird's description is based upon six specimens, three from Fort Yuma, California, and three from "Colorado bottom, Cal." There is nothing to indicate that any one specimen was regarded as more typical than any of the others. It seems best, however, to restrict the cotypes to the three first mentioned as from Fort Yuma, since this is a definite locality; and to consider the three from "Colorado bottom" as paratypes. Much of the description is based upon details of the soles of the feet, which could be made out more readily in alcoholic specimens. Two of the Fort Yuma specimens were in alcohol, while all the "Colorado bottom" specimens were skins.

Peromyscus spicilegus evides Osgood. Biological Survey coll.

Proc. Biol. Soc. Wash., XVII, p. 64, March 21, 1904.

71426. Skin and skull. Adult male. Juquila, Oaxaca, Mexico. February 28, 1895. Collected by E. W. Nelson and E. A. Goldman. Original number 7572.

Well-made skin in good condition; skull perfect.

Peromyscus felipensis Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XII, pp. 122–123, April 30, 1898.

68409. Skin and skull. Adult male. Cerro San Felipe, Oaxaca, Mexico. August 22, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 6611.

Well-made skin in good condition; skull perfect.

Peromyscus sonoriensis fulvus Osgood. Biological Survey coll.

Proc. Biol. Soc. Wash., XVII, p. 57, March 21, 1904.

68655. Skin and skull. Adult male. Oaxaca, Oaxaca, Mexico. June 12, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 6277.

Well-made skin in good condition; skull perfect.

Hesperomys gambelii Baird. Cotypes.

Mammals of North America, p. 464, 1857.

=**Peromyscus texanus gambelii** (Baird). See Allen, Bull. Amer. Mus. Nat. Hist., VIII, p. 267, December 4, 1896.

$\frac{368}{1282}$. Skin and skull, and tail vertebræ. $\frac{369}{1283}$. Skin (lost) and skull, and tail vertebræ. Monterey, California. Collected by Lieut. W. P. Trowbridge, U. S. A. Skins catalogued January 4, 1854; skulls, January 6, 1855.

Dr. J. A. Allen discusses the status of the type of this species in the Bulletin of the American Museum of Natural History, Volume V, 1893, pages 190 and 191. He says: "*Hesperomys gambelii* Baird was based primarily on two mounted specimens (Nos. $\frac{368}{1282}$ and $\frac{369}{1283}$) from Monterey, California, of which No. 369 should probably be regarded as the type, as it is the only specimen specifically mentioned in the original account of the species. This specimen, Mr. F. W. True informs me (in a letter dated June 8, 1893), is not now extant, and has not been in the collection for many years. No. 368, which may be considered as a cotype, is, through the kindness of Mr. True, now before me. It is, however, almost valueless for purposes of comparison, having become greatly faded from long exposure to light as a mounted specimen; it has also lost its ears and is in a sad plight generally. This is the only skin extant positively referred by Baird in his original account of the species to *H. gambelii*."

In a footnote on page 191, *op. cit.*, Dr. Allen skillfully eliminates from his cotypes a large number of specimens from various localities that Baird lists in the original description.

Skin No. 368 in very poor condition, much faded and without ears; No. 369 can not be found. Skull No. 1282 lacks both malars, No. 1283 lacks all the right upper molars and left malar, otherwise both in good condition.

Peromyscus gratus gentilis Osgood. Biological Survey collection.

Proc. Biol. Soc. Wash., pp. 61–62, March 21, 1904.

78937. Skin and skull. Adult male. Lagos, Jalisco, Mexico. June 27, 1896. Collected by E. W. Nelson and E. A. Goldman. Original number 9702.

Well-made skin in good condition; skull perfect.

Peromyscus goldmani Osgood. Biological Survey collection.

Proc. Biol. Soc. Wash., XVII, p. 75, March 21, 1904.

96340. Skin and skull. Adult female. Alamos, Sonora, Mexico. December 19, 1898. Collected by E. A. Goldman. Original number 13306.

Well-made skin in good condition; skull perfect.

Hesperomys gossypinus Le Conte. Cotype.

Proc. Acad. Nat. Sci. Phila., VI, p. 411, this paper was reported favorably for publication October 25, 1853.

=**Peromyscus gossypinus** (Le Conte). See Rhoads, Proc. Acad. Nat. Sci. Phila., 1896, p. 189, April 21, 1896.

546. Skin. Male. Riceboro, Georgia. September 13, 1847. Collected by Major J. E. Le Conte, U. S. A. Catalogued March 8, 1855. It can not be found.

4704. Skin, skull inside. Riceboro, Georgia. Collected by Major J. E. Le Conte, U. S. A. Catalogued April 13, 1861.

Skin in fair condition, but tail not skinned out; skull still in the skin.

As this is the only one extant in the National Museum of Le Conte's original specimens, it is perhaps well to treat it as a cotype.

No. 546 is the only specimen from Georgia listed in Baird's Mammals of North America. Later, other specimens from Le Conte, from Georgia, came into

the collection—4704, 4705, and 4711. Of these, 4704 is the only one that can be found. The published measurements of 546, both in Baird's Mammals of North America, page 469, and Coues's Monographs of North American Rodentia, page 78, more nearly agree with the measurements of the original description than the measurements of any of the others do.

Hesperomys gracilis Le Conte.

Proc. Acad. Nat. Sci. Phila., VII, p. 442, ordered published at meeting of December 25, 1855.

=**Peromyscus gracilis** (Le Conte).

$\frac{10292}{38002}$. Skin and skull. Received from Major J. E. Le Conte, U. S. A. Date and locality unknown. Skin catalogued October 15, 1872; skull, May 26, 1902.

The skin is in very poor condition. The left hind leg is the only one present. The skull, removed in May, 1902, is somewhat more serviceable. The posterior half of the brain-case has been cut away; the left zygoma is missing. The right half of the mandible is perfect, while the ascending portion of the left half is broken off.

Attached to the specimen are three labels reading as follows:

(1) "Monograph of American Muridæ. Dr. Elliott Coues, U. S. A. No. 10292. Type of *Hesperomys gracilis*=*leucopus*."

(2) "*Hesp. 'gracilis'* Le Conte type specimen Wisconsin? Ohio? Michigan?" pasted on the reverse side of this label is "*gracilis*."

(3) "Monograph of American Muridæ. Dr. Elliott Coues, U. S. A. No. 10292. *Hesperomys leucopus*."

There is little in the original description to indicate that this specimen is the type. The entry in the catalogue for 10292 reads "Dry type of *gracilis*."

On page 51, Monographs of North American Rodentia, under the synonomy of *Hesperomys leucopus*, Dr. Coues gives "*Hesperomys gracilis*, Le Conte, Proc. Acad. Nat. Sci. Phila., VII, 1855, 442 (Ohio or Michigan and Wisconsin; types Nos.——, 4710, Mus. Smiths.)." The dash may refer to the above specimen; the other specimen, 4710, is one not quite so poor. There is nothing about its labels or catalogue entry to indicate that it is a type or cotype.

Peromyscus gratus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XII, p. 128, April 30, 1898.

50619. Skin and skull. Adult female. Tlalpam, Federal District, Mexico. November 30, 1892. Collected by E. W. Nelson. Original number 3927.

Well-made skin in good condition; skull perfect.

Peromyscus guatemalensis Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XII, p. 118, April 30, 1898.

76861. Skin and skull. Adult male. Todos Santos, Guatemala. December 31, 1895. Collected by E. W. Nelson and E. A. Goldman. Original number 8991.

Well-made skin in good condition; skull perfect, except for absence of right coronoid process.

Peromyscus hylæus Osgood. Biological Survey collection.

Proc. Biol. Soc. Wash., XXI, pp. 141-142, June 9, 1908.

127038. Skin and skull. Adult male. Hollis, Kasaan Bay, Prince of Wales Island, Alaska. May 15, 1903. Collected by W. H. Osgood. Original number 2234.

Well-made skin in good condition; skull perfect.

Peromyscus hylocetes Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XII, p. 124, April 30, 1898.

50423. Skin and skull. Adult female. Patzcuaro, Michoacan, Mexico. July 27, 1892. Collected by E. W. Nelson and E. A. Goldman. Original number 2961.

Well-made skin in good condition; skull perfect.

Peromyscus pectoralis laceianus Bailey. Biological Survey coll.

Proc. Biol. Soc. Wash., XIX, p. 57, May 1, 1906.

97063. Skin and skull. Adult male. Ranch of Howard Lacey, Turtle Creek, near Kerrville, Texas. May 3, 1899. Collected by V. Bailey. Original number 6860.

Well-made skin in good condition; skull perfect.

Peromyscus boylei laceyi Bailey. Biological Survey collection.

North Amer. Fauna, No. 25, pp. 99-100, October 24, 1905.

= **Peromyscus attwateri** Allen. See Bailey, Proc. Biol. Soc. Wash., XIX, p. 57, May 1, 1906.

92746. Skin and skull. Adult male. Turtle Creek, Kerr County, Texas. December 4, 1897. Collected by H. P. Attwater. Original number 1372x.

Well-made skin in good condition; skull perfect, except for absence of last right lower molar.

Peromyscus lepturus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XII, pp. 118-119, April 30, 1898.

68612. Skin and skull. Adult male. Mount Zempoaltepec, Oaxaca, Mexico. July 8, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 6381.

Well-made skin in good condition ; skull perfect.

Peromyscus levipes Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XII, pp. 123-124, April 30, 1898.

53673. Skin and skull. Adult male. Mount Malinche, Tlaxcala, Mexico. May 12, 1893. Collected by E. W. Nelson. Original number 4799.

Well-made skin in good condition ; skull perfect.

Peromyscus lophurus Osgood. Biological Survey collection.

Proc. Biol. Soc. Wash., XVII, p. 72, March 21, 1904.

77219. Skin and skull. Adult male. Todos Santos, Guatemala. December 30, 1895. Collected by E. W. Nelson and E. A. Goldman. Original number 8956.

Well-made skin in good condition; skull perfect.

Peromyscus luteus Osgood. Biological Survey collection.

Proc. Biol. Soc. Wash., XVIII, p. 78, February 21, 1905.

$\frac{18658}{25447}$. Skin and skull. Adult female. Kennedy, Nebraska. April 23, 1890. Collected by V. Bailey. Original number 1079.

Well-made skin in good condition; skull perfect.

Hesperomys macropus Merriam. Biological Survey collection.

North Amer. Fauna, No. 4, pp. 53–54, October 8, 1890.

=**Peromyscus floridanus** (Chapman). See Chapman, Bull. Amer. Mus. Nat. Hist., VI, p. 336, November 30, 1894; Trouessart, Catalogus Mammalium, p. 516 1897.

$\frac{16582}{23613}$. Skin and skull. Adult male. Lake Worth, Florida. May 5, 1889. Collected by M. M. Green. Original number 72.

Well-made skin in good condition; skull perfect, except for absence of left coronoid process.

Peromyscus madrensis Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XII, p. 16, January 27, 1898.

89223. Skin and skull. Adult male. Maria Madre Island, Tres Marias Islands, Mexico. May 18, 1897. Collected by E. W. Nelson and E. A. Goldman. Original number 11040.

Well-made skin in good condition; skull perfect.

Peromyscus texanus medius Mearns.

Preliminary Diagnoses of New Mammals from the Mexican Border of the United States, p. 4, March 25, 1896. (Reprinted in Proc. U. S. Nat. Mus., XVIII, No. 1075, p. 446, May 23, 1896.)

61059. Skin and skull. Adult male. Nachoguero Valley, near monument No. 238, Mexican Boundary line, Lower California, Mexico. June 4, 1894. Collected by Dr. E. A. Mearns, U. S. A. Original number 3623. International Boundary Commission. Catalogued November 17, 1894.

Well-made skin in good condition; skull perfect, except for loss of angular process on left half of mandible.

Peromyscus megalops Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XII, p. 119, April 30, 1898.

71592. Skin and skull. Old male. Mountains near Ozolotepec, Oaxaca, Mexico. March 26, 1895. Collected by E. W. Nelson and E. A. Goldman. Original number 7733.

Well-made skin in good condition; skull perfect, except for absence of first upper molars, and angular processes of mandible.

Hesperomys megalotis Merriam. Biological Survey collection.

North Amer. Fauna, No. 3, pp. 63–64, pl. 3, figs. 1–4, pl. 4; September 4, 1890. =**Peromyscus truei** (Shufeldt).

$\frac{17843}{24854}$. Skin and skull. Adult male. Black Tank, Little Colorado Desert, Arizona. September 21, 1889. Collected by Dr. C. Hart Merriam and V. Bailey. Original number 502.

Well-made skin in good condition; skull perfect.

Peromyscus mekisturus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XII, pp. 124–125, April 30, 1898.

64108. Skin and skull. Adult female. Chalchicomula, Puebla, Mexico. March 16, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 5951.

Well-made skin in good condition; skull perfect, except for broken left lower incisor.

Peromyscus melanocarpus Osgood. Biological Survey collection.

Proc. Biol. Soc. Wash., XVII, pp. 73–74, March 21, 1904.

68610. Skin and skull. Young adult female. Mount Zempoaltepec, Oaxaca, Mexico. July 8, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 6379.

Well-made skin in good condition; skull perfect, except for broken right zygoma.

Hesperomys (Vesperimus) melanophrys Coues.

Proc. Acad. Nat. Sci. Phila., 1874, p. 181, December 15, 1874. =**Peromyscus melanophrys** (Coues). See Allen, Bull. Amer. Mus. Nat. Hist., IX, p. 51, March 15, 1897.

$\frac{10183}{12453}$. Skin and skull. Adult. Santa Efigenia, near Tapana, Oaxaca, Mexico. July 11, 1871. Collected by Prof. F. Sumichrast. Original number 2. Skin catalogued February 24, 1872; skull, January 4, 1873.

The skin is in good condition and fairly well made up, except that tail has never been skinned out. The following parts are lacking on the skull: All four occipital bones, both malars, and both angular processes of the mandible.

The original label bears the following legible measurements: "Lg. tot. 245 mill.—tip of snout to tail (below) 11 centim.—tail 135 mill.—from tip of nose to eye 15 mill.—ditto to ear 25.—ear, exteriorly 20 mill., interiorly 22 mill."

Peromyscus merriami Mearns.

Preliminary Diagnoses of New Mammals from the Mexican Border of the United States, p. 2, May 25, 1896. (Reprinted in Proc. U. S. Nat. Mus., XIX, No. 1103, p. 138, December 21, 1896.)

59234. Skin and skull. Adult female. Sonoyta, on the Sonoyta River, Sonora, Mexico. January 21, 1894. Collected by Dr. E. A. Mearns, U. S. A., and F. X. Holzner. Original number 2815. International Boundary Commission. Catalogued February 23, 1894.

Well-made skin in good condition; skull perfect.

Peromyscus texanus mesomelas Osgood. Biological Survey coll.

Proc. Biol. Soc. Wash., XVII, pp. 57–58, March 21, 1904.

58210. Skin and skull. Adult male. Orizaba, Vera Cruz, Mexico. January 20, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 5705.

Well-made skin in good condition; skull perfect.

Peromyscus leucopus minnesotæ Mearns.

Proc. Biol. Soc. Wash., XIV, p. 154, August 9, 1901.

82717. Skin and skull. Adult female. Fort Snelling, Hennepin County, Minnesota. November 30, 1890. Collected by Dr. E. A. Mearns, U. S. A. Original number 1181. Catalogued July 30, 1896.

Well-made skin in good condition; skull perfect.

Peromyscus musculoides Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XII, p. 124, April 30, 1898.

69661. Skin and skull. Old male. Cuicatlan, Oaxaca, Mexico. October 14, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 6892.

Well-made skin in good condition; skull perfect.

Sitomys musculus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., VII, pp. 170–171, September 29, 1892.

=**Peromyscus musculus** (Merriam). See Allen and Chapman, Bull. Amer. Mus. Nat. Hist., IX, p. 203, June 16, 1897.

$\frac{33437}{45460}$. Skin and skull. Adult male. Colima, Colima, Mexico. March 9, 1892. Collected by E. W. Nelson. Original number 2055.

Well-made skin in good condition; skull perfect.

Peromyscus (Megadontomys) nelsoni Merriam. Biol. Survey coll.

Proc. Biol. Soc. Wash., XII, pp. 116–117, April 30, 1898.

55024. Skin and skull. Adult female. Jico, Vera Cruz, Mexico. July 10, 1893. Collected by E. W. Nelson. Original number 5202.

Well-made skin in good condition; skull perfect, except for absence of last left upper molar.

Peromyscus musculus nigrescens Osgood. Biological Survey coll.

Proc. Biol. Soc. Wash., XVIII, p. 76, March 21, 1904.

76827. Skin and skull. Adult female. Valley of Comitan, Chiapas, Mexico. December 9, 1895. Collected by E. W. Nelson and E. A. Goldman. Original number 8719.

Well-made skin in good condition; skull perfect.

Peromyscus oaxacensis Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XII, p. 122, April 30, 1898.

68426. Skin and skull. Young adult male. Cerro San Felipe, Oaxaca, Mexico. September 1, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 6700.

Well-made skin in good condition; skull perfect.

Peromyscus mexicanus orizabæ Merriam. Biological Survey coll.

Proc. Biol. Soc. Wash., XII, pp. 121–122, April 30, 1898.

58197. Skin and skull. Adult male. Orizaba, Vera Cruz, Mexico. January 29, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 5787.

Well-made skin in good condition; skull perfect.

Peromyscus attwateri pectoralis Osgood. Biological Survey coll.

Proc. Biol. Soc. Wash., XVII, pp. 59–60, March 21, 1904.

=**Peromyscus pectoralis** (Osgood). See Bailey, Proc. Biol. Soc. Wash., XIX, p. 57, May 1, 1906.

81236. Skin and skull. Adult male. Jalpan, Queretaro, Mexico. August 30, 1896. Collected by E. W. Nelson and E. A. Goldman. Original number 10095.

Well-made skin in good condition; skull perfect, except for absence of last upper molars.

Peromyscus boylii penicillatus Mearns.

Preliminary Diagnoses of New Mammals from the Mexican Border of the United States, p. 2, May 25, 1896. (Reprinted in Proc. U. S. Nat. Mus., XIX, No. 1103, p. 139, December 21, 1896.)

=**Peromyscus boylei rowleyi** (Allen). See Bailey, North Amer. Fauna, No. 25, p. 98, October 24, 1905.

$\frac{20034}{35426}$. Skin and skull. Adult female. Foothills of Franklin Mountains near El Paso, Texas. February 19, 1892. Collected by Dr. E. A. Mearns, U. S. A., and F. X. Holzner. Original number 1463. International Boundary Commission. Catalogued April 28, 1892.

Well-made skin in good condition; skull perfect, except for loss of angular process of left half of mandible.

Peromyscus eremicus phæurus Osgood. Biological Survey coll.

Proc. Biol. Soc. Wash., XVII, pp. 75–76, March 21, 1904.

50438. Skin and skull. Adult female. Hacienda La Parada, San Luis Potosi, Mexico. August 20, 1892. Collected by E. W. Nelson. Original number 3227.

Well-made skin in good condition; skull perfect, except for slight perforations of left audital bulla and left parietal.

Peromyscus polius Osgood. Biological Survey collection.

Proc. Biol. Soc. Wash., XVII, p. 61, March 21, 1904.

98226. Skin and skull. Adult female. Colonia Garcia, Chihuahua, Mexico. June 26, 1899. Collected by E. W. Nelson and E. A. Goldman. Original number 13846.

Well-made skin in good condition; skull perfect.

Peromyscus prevostensis Osgood. Biological Survey collection.

North Amer. Fauna, No. 21, pp. 29–30, September 26, 1901.

100818. Skin and skull. Adult female. Prevost Island, Queen Charlotte Islands, British Columbia. July 5, 1900. Collected by W. H. Osgood and E. Heller. Original number 1135.

Well-made skin in good condition; skull perfect.

Peromyscus oreas rubidus Osgood. Biological Survey collection.

Proc. Biol. Soc. Wash., XIV, pp. 193–194, December 12, 1901.

91650. Skin and skull. Young adult female. Mendocino City, Mendocino County, California. November 17, 1897. Collected by J. A. Loring. Original number 4925.

Well-made skin in good condition; skull perfect.

Hesperomys leucopus rufinus Merriam. Biological Survey coll.

North Amer. Fauna, No. 3, pp. 64–66, pl. 3, figs. 5–8, September 4, 1890.

=**Peromyscus rufinus** (Merriam).

$\frac{17646}{24582}$. Skin and skull. Adult female. San Francisco Mountain, Arizona. August 22, 1889. Collected by Dr. C. Hart Merriam and V. Bailey. Original number 401.

Well-made skin in good condition, except for a bare spot on left side; skull perfect.

Peromyscus mexicanus saxatilis Merriam. Biological Survey coll.

Proc. Biol. Soc. Wash., XII, p. 121, April 30, 1898.

77296. Skin and skull. Adult male. Jacaltenango, Huehuetenango, Guatemala. December 19, 1895. Collected by E. W. Nelson and E. A. Goldman. Original number 8824.

Well-made skin in good condition; skull perfect.

Peromyscus simulatus Osgood. Biological Survey collection.

Proc. Biol. Soc. Wash., XVII, pp. 72–73, March 21, 1904.

55028. Skin and skull. Adult female. Jico, Vera Cruz, Mexico. July 12, 1893. Collected by E. W. Nelson. Original number 5224.

Well-made skin in good condition; skull perfect.

Peromyscus spicilegus simulus Osgood. Biological Survey coll.

Proc. Biol. Soc. Wash., XVII, pp. 64–65, March 21, 1904.

88088. Skin and skull. Adult male. San Blas, Tepic, Mexico. April 18, 1897. Collected by E. W. Nelson and E. A. Goldman. Original number 10933.

Well-made skin in good condition; skull perfect, except for absence of last right upper molar.

Peromyscus sitkensis Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XI, p. 223, July 15, 1897.

73809. Skin and skull. Adult male. Sitka, Alaska. July 30, 1895. Collected by C. P. Streator. Original number 4720.

Well-made skin in good condition; skull perfect.

Hesperomys sonoriensis Le Conte.

Proc. Acad. Nat. Sci. Phila., VI, p. 413, this paper was reported favorably for publication October 25, 1853.

=**Peromyscus sonoriensis** (Le Conte). See Mearns, Bull. U. S. Nat. Mus., No. 56, p. 384, April 13, 1907.

$\frac{146}{1128}$. Skin and skull. Young. Santa Cruz, Sonora, Mexico. 1851. Collected by J. H. Clark on expedition under command of Col. J. D. Graham, U. S. A. Catalogued May 19, 1853.

The skin is well made up, probably remade, but the specimen has a worn and dirty look about it. Skull much broken, but now patched up, so that the missing parts are the two zygomatic arches, the last left upper molar, and the angular, condyloid, and coronoid processes of the right half of the mandible.

Type not designated by number, but it is mentioned as one "collected by the Boundary Commission under Major Graham." Referring to Baird's Mammals of North America, page 476, there are found to be three specimens collected by that commission—nos. 144, 146, and 147. The measurements of no. 146 agree very closely with the measurements given by Le Conte; no. 144 does not agree with them at all, and of no. 147 no measurements are given and the specimen itself can not be found. No. 146 is evidently the type. It was so considered and marked by Coues in 1877.

Peromyscus stephensi Mearns.

Proc. U. S. Nat. Mus., XIX, No. 1121, p. 721, July 30, 1897.

61026. Skin and skull. Adult female. From the lowest water on the wagon road, in a canyon at the eastern base of the Coast Range Mountains, San Diego County, near Mexican boundary line, California. May 9, 1894. Collected by Dr. E. A. Mearns, U. S. A. Original number 3512. International Boundary Commission. Catalogued November 17, 1894.

Well-made skin in good condition. Skull perfect, except right zygoma broken and some slight injury at base of foramen magnum.

Peromyscus taylori subater Bailey. Biological Survey collection.

North Amer. Fauna, No. 25, pp. 102–103, fig. 15, October 24, 1905.

$\frac{32616}{44639}$. Skin and skull. Adult female. Bernard Creek, near Columbia, Texas. February 25. 1892. Collected by W. Lloyd. Original number 1122.

Well-made skin in good condition; skull perfect.

Peromyscus mexicanus teapensis Osgood. Biological Survey coll.

Proc. Biol. Soc. Wash., XVII, pp. 69–70, March 21, 1904.

100022. Skin and skull. Adult female. Teapa, Tabasco, Mexico. March 25, 1900. Collected by E. W. Nelson and E. A. Goldman. Original number 14067.

Well-made skin in good condition; a bare spot on abdomen; skull perfect.

Peromyscus tehuantepecus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XII, p. 122, April 30, 1898.

75302. Skin and skull. Adult female (not male as in original description). Tehuantepec, Oaxaca, Mexico. May 23, 1895. Collected by E. W. Nelson and E. A. Goldman. Original number 7980.

Well-made skin in good condition; skull perfect.

Hesperomys texanus Woodhouse.

Proc. Acad. Nat. Sci. Phila., VI, p. 242, this paper was reported favorably for publication February 22, 1853.

=**Peromyscus texanus** (Woodhouse). See Mearns, Bull. U. S. Nat. Mus., No. 56, p. 404, April 13, 1907.

$\frac{2559}{37026}$. Skin preserved in alcohol and fragments of skull. Western Texas on the Rio Grande near El Paso, according to published statements of Woodhouse, but probably from south-central Texas. (See Mearns, Bull. U. S. Nat. Mus., No. 56, p. 406, April 13, 1907.) Collected by Dr. S. W. Woodhouse, on Capt. L. Sitgreaves's expedition, probably in autumn of 1852. Skin catalogued April, 1857; skull, January 12, 1896.

Skin in alcohol, a miserable looking affair and much discolored. Feet and leg bones complete and perfect. Skull represented by the greater portion of each half of the mandible, most of the rostrum, and a portion of each maxillary bone, each piece containing the two anterior molars.

Type not designated by number. In the description but one specimen is implied, and in Baird's Mammals, under list of specimens, 2559 is the only one having the data of Doctor Woodhouse's specimen. Another specimen, No. $\frac{4748}{37155}$, labeled "*Hesperomys texana* W. Texas, Dr. Woodhouse," is in the Museum, but this was not mentioned by Baird and has not been regarded as a type, although it may have been in the hands of Dr. Woodhouse when the description was written.

Peromyscus (Megadontomys) thomasi Merriam. Biol. Survey coll.

Proc. Biol. Soc. Wash., XII, p. 116, fig. 20, April 30, 1898.

70142. Skin and skull. Old male. Mountains near Chilpancingo, Guerrero, Mexico. December 24, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 7250.

Well-made skin in good condition; skull perfect.

Peromyscus tiburonensis Mearns.

Proc. U. S. Nat. Mus., XIX, No. 1121, p. 720, July 30, 1897.

63186. Skin and skull. Adult male. Tiburon Island, Gulf of California, Mexico. December 25, 1895. Collected by J. W. Mitchell. Original number 1. Catalogued March 16, 1896.

Skin in fair condition, recently made into a modern study skin, a small area on the left flank without hair; skull perfect, except for loss of right malar.

Peromyscus tornillo Mearns.

Preliminary Diagnoses of New Mammals from the Mexican Border of the United States, p. 3, March 25, 1896. (Reprinted in Proc. U. S. Nat. Mus., XVIII, No. 1075, p. 445, May 23, 1896.)

$\frac{20025}{35420}$. Skin and skull. Adult male. Six miles above El Paso, Texas, on the Rio Grande. February 18, 1892. Collected by Dr. E. A. Mearns, U. S. A., and F. X. Holzner. Original number 1458. International Boundary Commission. Catalogued April 28, 1892.

Well-made skin in good condition; skull perfect, except for loss of left malar.

Peromyscus mexicanus totontepecus Merriam. Biol. Survey coll.

Proc. Biol. Soc. Wash., XII, pp. 120–121, April 30, 1898.

68624. Skin and skull. Adult female. Totontepec, Oaxaca, Mexico. July 16, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 6465.

Well-made skin in good condition; skull perfect, except for slightly broken basioccipital and right zygoma.

Hesperomys truei Shufeldt.

Proc. U. S. Nat. Mus, VIII, p. 405, pl. 21, figs. 1, 5, and 8, September 14, 1885.

=**Peromyscus truei** (Shufeldt). See Allen, Bull. Amer. Mus. Nat. Hist., VII, p. 229, June 29, 1895.

$\frac{14954}{35108}$. Skin, skull, and skeleton. Adult male. Fort Wingate, New Mexico. March 14, 1885. Collected by Dr. R. W. Shufeldt, U. S. A. Skin catalogued April 17, 1885; skull, April 9, 1891.

Fairly well-made skin in good condition. Right fore and left hind leg used for the skeleton. Skull with both malars absent, and pterygoids injured. Two right upper and lower posterior molars and last left lower molar missing. Angular process of left half of mandible broken off. Greater part of skeleton seems to be present but mostly disarticulated.

Type designated by number on page 405 of the original description, where it reads "14904," evidently a mistake for 14954, as 14904 refers in the Museum catalogue to a *Neotoma* collected by Doctor Shufeldt at Fort Wingate.

Peromyscus banderanus vicinior Osgood. Biological Survey coll.

Proc. Biol. Soc. Wash., XVII, pp. 68–69, March 21, 1904.

126503. Skin and skull. Adult male. La Salada, Michoacan, Mexico. March 23, 1903. Collected by E. W. Nelson and E. A. Goldman. Original number 16216.

Well-made skin in good condition; skull perfect.

Peromyscus xenurus Osgood. Biological Survey collection.

Proc. Biol. Soc. Wash., XVII, p. 67, March 21, 1904.

94518. Skin and skull. Adult female. Durango, Durango, Mexico. July 1, 1898. Collected by E. W. Nelson and E. A. Goldman. Original number 12677.

Well-made skin in good condition; skull perfect, except for absence of last right and left upper molars.

Peromyscus melanotis zamelas Osgood. Biological Survey coll.

Proc. Biol. Soc. Wash., XVII, p. 59, March 21, 1904.

98197. Skin and skull. Adult female. Colonia Garcia, Chihuahua, Mexico. July 24, 1899 (not July 23, 1899, as in original description). Collected by E. W. Nelson and E. A. Goldman. Original number 13915.

Well-made skin in good condition; skull perfect.

Peromyscus melanophrys zamoræ Osgood. Biological Survey coll.

Proc. Biol. Soc. Wash., XVII, pp. 65–66, March 21, 1904.

120288. Skin and skull. Adult male. Zamora, Michoacan, Mexico. January 20, 1903. Collected by E. W. Nelson and E. A. Goldman. Original number 15783.

Well-made skin in good condition; skull perfect.

Peromyscus zarhynchus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XII, p. 117, April 30, 1898.

76119. Skin and skull. Adult female. Tumbala, Chiapas, Mexico. October 26, 1895. Collected by E. W. Nelson and E. A. Goldman. Original number 8606.

Well-made skin in good condition; skull perfect.

Peromyscus zelotes Osgood. Biological Survey collection.

Proc. Biol. Soc. Wash., XVII, pp. 67–68, March 21, 1904.

50430. Skin and skull. Adult female. Querendaro, Michoacan, Mexico. August 8, 1892. Collected by E. W. Nelson. Original number 3056.

Well-made skin in good condition; skull perfect.

Genus NYCTOMYS.

Sitomys (Rhipidomys) decolorus True.

Proc. U. S. Nat. Mus., XVI, No. 963, p. 689, February 5, 1894.

=**Nyctomys decolorus** (True). See Bangs, Bull. Mus. Comp. Zool., XXXIX, p. 30, April, 1902.

$\frac{21002}{35129}$. Skin and skull. Young adult female. Rio de las Piedras, Honduras. November 17, 1890. (Not Dec. 11, 1890, as in original description. The original label is marked thus: "17 11.90." The "7" is rather blotted, but scarcely looks like a "2.") Collected by Erich Wittkügel.

Original number 9. Catalogued August 12, 1893.

Well-made skin in good condition; skull with nearly all of each zygoma broken away; otherwise complete.

Type not designated as such by number, but the single specimen is referred to by number.

Genus TYLOMYS.

Tylomys bullaris Merriam. Biological Survey collection.

Proc. Wash. Acad. Sci., III, p. 561, November 29, 1901.

76058. Skin and skull. Immature male. Tuxtla, Chiapas, Mexico. September 7, 1895. Collected by E. W. Nelson and E. A. Goldman. Original number 8406.

Well-made skin in good condition; skull perfect, except for absence of nasals.

Tylomys tumbalensis Merriam. Biological Survey collection.

Proc. Wash. Acad. Sci., III, pp. 560–561, November 29, 1901.

76059. Skin and skull. Young adult male. Tumbala, Chiapas, Mexico. October 23, 1895. Collected by E. W. Nelson and E. A. Goldman. Original number 8568.

Well-made skin in good condition; skull perfect.

Genus OTOTYLOMYS.

Ototylomys phyllotis Merriam. Biological Survey collection.

Proc. Wash. Acad. Sci., III, pp. 562–563, November 29, 1901.

108099. Skin and skull. Old male. Tunkas, Yucatan, Mexico. February 17, 1901. Collected by E. W. Nelson and E. A. Goldman. Original number 14551.

Well-made skin in good condition; skull perfect.

Ototylomys phyllotis phæus Merriam. Biological Survey coll.

Proc. Wash. Acad. Sci., III, p. 563, November 29, 1901.

107940. Skin and skull. Adult female. Apazote, near Yohaltun, Campeche, Mexico. December 28, 1900. Collected by E. W. Nelson and E. A. Goldman. Original number 14369.

Well-made skin in good condition, except for bare space on left shoulder; left ear attached to skin with thread; skull perfect.

Genus EUNEOMYS.

Euneomys petersoni Allen.

Bull. Amer. Mus. Nat. Hist., XIX, p. 192, May 9, 1903.

84198. Skin and skull. Adult female. Upper Rio Chico de Santa Cruz, near the Cordilleras, Patagonia. February 10, 1897. Collected by O. A. Peterson. Original number 390. Catalogued March 16, 1898.

Well-made skin in good condition; skull slightly damaged; pterygoids absent, left bulla broken, tip of right nasal broken, both angular processes of lower jaw broken away.

Genus OXYMYCTERUS.

Oxymycterus microtus Allen.

Bull. Amer. Mus. Nat. Hist., XIX, p. 189, May 9, 1903.

84234. Skin and skull. Adult male. Pacific slope of the Cordilleras near the head of the Rio Chico de Santa Cruz, Patagonia. March 7, 1897. Collected by O. A. Peterson. Original number 570. Catalogued March 16, 1898.

Well-made skin in good condition; skull perfect, except that left zygoma is broken.

Genus REITHRODON.

Reithrodon hatcheri Allen.

Bull. Amer. Mus. Nat. Hist., XIX, p. 191, May 9, 1903.

84210. Skin and skull. Adult male. Pacific slope of the Cordilleras, head of the Rio Chico de Santa Cruz, Patagonia. March 11, 1897. Collected by O. A. Peterson. Original number 600. Catalogued March 16, 1898.

Well-made skin in good condition, but lacks left fore and right hind legs. [It was Mr. Peterson's custom to save a good many skeletons of the animals he had skinned or to make up the skins of the animals he had saved for skeletons.] The skeleton of this individual was probably saved, but there is no record of its being in the Museum. Skull perfect except condyle of right half of mandible broken off, and corresponding angular process is slightly damaged.

Genus MUS.

Mus albigularis Mearns.

Proc. U. S. Nat. Mus., XXVIII, No. 1402, p. 440, May 13, 1905.

125258. Skin and skull. Adult male. Mount Apo (7,600 feet altitude), southern Mindanao, Philippine Islands. July 3, 1904. Collected by Dr. E. A. Mearns, U. S. A. Original number 5699. Catalogued December 12, 1904.

Well-made skin in good condition; skull perfect.

Mus anambæ Miller.

Proc. Wash. Acad. Sci., II, p. 205, August 20, 1900.

101737. Skin and skull. Adult female. Pulo Jimaja, Anamba Islands, South China Sea. September 21, 1899. Collected by Dr. W. L. Abbott. Catalogued January 20, 1900.

Well-made skin in good condition; skull perfect, except for absence of malars and both pterygoids.

Mus vulcani apicis Mearns.

Proc. U. S. Nat. Mus., XXVIII, No. 1402, p. 447, May 13, 1905.

125229. Skin and skull. Adult female. Summit of Mount Apo (altitude about 9,700 feet), southern Mindanao, Philippine Islands. June 6, 1904. Collected by Dr. E. A. Mearns, U. S. A. Original number 5709. Catalogued December 12, 1904.

Well-made skin in good condition; skull damaged in pterygoid region, a diagonal hole in brain-case across posterior portion of parietals, and free end of left nasal broken away.

Mus aquilus True.

Proc. U. S. Nat. Mus., XV, No. 915, p. 460, fig. 1, October 26, 1892.

$\frac{18997}{34723}$. Skin and skull. Adult male. Mt. Kilimanjaro, German East Africa; altitude, 8,000 feet. April 11, 1888. Collected by Dr. W. L. Abbott. Catalogued June 24, 1890.

Skin in good condition, fairly well made up; skull has the right posterior and basal portion of brain case broken away. The specimen was killed by a hawk.

Mus asper Miller.

Proc. Biol. Soc. Wash., XIII, p. 145, pl. 5., fig. 3, April 21, 1900.

86767. Skin and skull. Adult female. Khow Sai Dow (1,000 feet) Trong (or Tarang), lower Siam. February 2, 1899. Collected by Dr. W. L. Abbott. Catalogued July 19, 1899.

Well-made skin in good condition; skull perfect.

Mus atratus Miller.

Proc. U. S. Nat. Mus., XXIV, No. 1269, p. 767, pl. 41, fig. 5; pl. 42, figs. 5, 5a; May 28, 1902. Name preoccupied by *Mus atratus* Philippi. (Annales del Museo Nacional de Chile, Entrega, XIV, p. 57, 1900.)

=**Mus atridorsum** Miller. See Proc. Biol. Soc. Wash., XVI, p. 50, March 19, 1903.

111868. Skin and skull. Adult female. Barren Island, Andaman Islands. January 7, 1901. Collected by Dr. W. L. Abbott. Original number 818. Catalogued August 17, 1901.

Well-made skin in good condition: skull perfect.

Bullimus bagobus Mearns.

Proc. U. S. Nat. Mus., XXVIII, No. 1402, p. 450, May 11, 1905.

=**Mus bagobus** (Mearns). See Thomas, Proc. Zool. Soc. London, 1907, p. 141.

125248. Skin and skull. Adult female. Todaya (altitude 4,000 feet) Mount Apo, southern Mindanao, Philippine Islands. July 13, 1904. Collected by Dr. E. A. Mearns, U. S. A. Original number 5729. Catalogued December 12, 1904.

Fairly well-made skin in fair condition, slight loss of hair on lower abdomen; skull perfect.

Mus balæ Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 33, November 6, 1903.

121781. Skin and skull. Adult female. Tana Bala, Batu Islands, off west coast of Sumatra. February 12, 1903. Collected by Dr. W. L. Abbott. Original number 2274. Catalogued August 2, 1903.

Well-made skin in good condition; skull perfect.

Mus batamanus Lyon.

Proc. U. S. Nat. Mus., XXXI, No. 1502, p. 654, January 16, 1907.

143232. Skin and skull. Adult male. Senimba Bay, Batam Island, Rhio-Linga Archipelago. March 30, 1906. Collected by C. Boden Kloss. Original number 75. Catalogued June 19, 1906.

Well-made skin in good condition; skull perfect, except that both lower incisors are broken off to alveoli.

Mus bentincanus Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 38, November 6, 1903.

104269. Skin and skull. Adult female. Bentinck Island, Mergui Archipelago. March 11, 1900. Collected by Dr. W. L. Abbott. Original number 348. Catalogued November 5, 1900.

Well-made skin in good condition; skull perfect.

Mus burrescens Miller.

Proc. U. S. Nat. Mus., XXIV, No. 1269, p. 771, May 28, 1902.

111789. Skin and skull. Adult female. Great Nicobar, Nicobar Islands. March 12, 1901. Collected by Dr. W. L. Abbott. Original number 926. Catalogued August 14, 1901.

Well-made skin in good condition; skull perfect.

Mus burrulus Miller.

Proc. U. S. Nat. Mus., XXIV, No. 1269, p. 770, May 28, 1902.

111817. Skin and skull. Adult male. Car Nicobar, Nicobar Islands. January 25, 1901. Collected by Dr. W. L. Abbott. Original number 865. Catalogued August 15, 1901.

Well-made skin in good condition; skull perfect.

Mus burrus Miller.

Proc. U. S. Nat. Mus., XXIV, No. 1269, p. 768, May 28, 1902.

111811. Skin and skull. Adult female. Trinkut Island, Nicobar Islands. February 5, 1902. Collected by Dr. W. L. Abbott. Original number 881. Catalogued August 14, 1901.

Well-made skin in good condition; skull nearly perfect, a piece of left pterygoid and nearly all of the left coronoid process of mandible missing.

Mus surifer butangensis Miller.

Proc. Biol. Soc. Wash., XIII, p. 190, December 21, 1900.

104309. Skin and skull. Adult male. Pulo Adang, Butang Islands, off west coast of Malay Peninsula. December 16, 1899. Collected by Dr. W. L. Abbott. Original number 157. Catalogued November 5, 1900.

Well-made skin in good condition; skull perfect.

Mus carimatæ Miller.

Proc. U. S. Nat. Mus., XXXI, No. 1481, p. 59, July 23, 1906.

125079. Skin and skull. Adult male. Telok Pai, Karimata Island, off west coast of Borneo. August 20, 1904. Collected by Dr. W. L. Abbott. Original number 3612. Catalogued December 8, 1904.

Well-made skin in good condition; skull perfect.

Mus casensis Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 38, November 6, 1903.

104249. Skin and skull. Adult male. Chance Island, Mergui Archipelago. December 28, 1899. Collected by Dr. W. L. Abbott. Original number 188. Catalogued November 5, 1900.

Fairly well-made skin in good condition, end of tail lost during life; skull perfect.

Mus catellifer Miller.

Proc. U. S. Nat. Mus., XXVI, No. 1317, p. 464, February 3, 1903.

114590. Skin and skull. Adult female. Pulo Mansalar, off Tapanuli Bay, west coast of Sumatra. March 3, 1902. Collected by Dr. W. L. Abbott. Original number 1587. Catalogued September 3, 1902.

Well-made skin in good condition; skull perfect, except for broken right upper incisor.

Mus clabatus Lyon.

Proc. U. S. Nat. Mus., XXXI, No. 1498, p. 596, December 18, 1906.

124888. Skin and skull. Adult female. Klabat Bay, island of Banka, east of Sumatra. June 25, 1904. Collected by Dr. W. L. Abbott. Original number 3439. Catalogued December 3, 1904.

Well-made skin in good condition; skull considerably damaged, posterior left half of brain case broken away, and right ramus of mandible broken in two.

Mus commissarius Mearns.

Proc. U. S. Nat. Mus., XXVIII, No. 1402, p. 449, May 13, 1905.

125213. Skin and skull. Adult female. Military commissary building at Davao, southern Mindanao, Philippine Islands. July 19, 1904. Collected by Dr. E. A. Mearns, U. S. A. Original number 5734. Catalogued December 12, 1904.

Fairly well-made skin in fair condition, some naked spots on belly; skull perfect, except loss of pterygoids.

Mus cremoriventer Miller.

Proc. Biol. Soc. Wash., XIII, p. 144, pl. 5, fig. 2, April 21, 1900.

86770. Skin and skull. Adult male. Khow Nok Ram (3,000 feet), Trong (or Tarang), lower Siam. January 16, 1899. Collected by Dr. W. L. Abbott. Catalogued July 19, 1899.

Well-made skin in good condition; skull perfect, except loss of 2 or 3 mm. of distal end of left nasal.

Mus defua Miller.

Proc. Wash. Acad. Sci., II, p. 635, December 28, 1900.

83837. Skin and skull. Adult male. Mount Coffee (400 to 500 feet), Liberia, West Africa. May 3, 1897. Collected by R. P. Currie. Original number 53. Catalogued September 30, 1897.

Well-made skin in good condition; skull perfect, except right pterygoid missing and some injury about the foramen magnum.

Mus domelicus Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 39, November 6, 1903.

104257. Skin and skull. Adult female. Domel Island, Mergui Archipelago. February 24, 1900. Collected by Dr. W. L. Abbott. Original number 320. Catalogued November 5, 1900.

Well-made skin in good condition; skull with both zygomata and both condyloid processes, and last upper molar, right side, lacking.

Mus domitor Miller.

Proc. U. S. Nat. Mus., XXVI, No. 1317, p. 461, February 3, 1903.

114621. Skin and skull. Adult female. Pulo Mansalar, at entrance to Tapanuli Bay, west coast of Sumatra. March 4, 1902. Collected by Dr. W. L. Abbott. Original number 1592. Catalogued September 3, 1902.

Well-made skin in good condition; skull perfect.

Mus enganus Miller.

Proc. U. S. Nat. Mus., XXX, No. 1472, p. 821, June 4, 1906.

140976. Skin and skull. Adult male. Engano Island, west of Sumatra. December 4, 1904. Collected by Dr. W. L. Abbott. Original number 3823. Catalogued July 18, 1905.

Well-made skin in good condition; skull perfect, except loss of pterygoids.

Mus exulans Peale.

U. S. Exploring Expedition, VIII, Mammalia and Ornithology, p. 47, 1848.

3730. Mounted skin with skull inside. Tahiti, Society Islands, Pacific Ocean. Collected by U. S. Exploring Expedition. Catalogued December 20, 1859.

Specimen old, dirty, much bleached, tail broken off, but still present. It was mounted on a walnut stand with this inscription painted on the bottom: " | 3730 · Mus exulans, Peale (Type) | (Mus penicillatus, Gould) | Tahiti Rat | Society Ids. T. R. Peale | ." This specimen is accordingly considered the type rather than any of the other specimens collected by the Exploring Expedition from widely separated islands in the Pacific.

Mus ferreocanus Miller.

Proc. Biol. Soc. Wash., XIII, p. 140, pl. 3, fig. 2, and pl. 4, fig. 2, April 21, 1900.

86737. Skin and skull. Adult female. Khow Nok Ram (3,000 feet), Trong (or Tarang), lower Siam. January 15, 1899. Collected by Dr. W. L. Abbott. Catalogued July 19, 1899.

Well-made skin in good condition, except a slight scar on the lower back; skull perfect.

Mus firmus Miller.

Proc. Acad. Nat. Sci. Phila., 1902, p. 155, June 11, 1902.

113038. Skin and skull. Adult female. Linga Island, Rhio-Linga Archipelago. August 25, 1901. Collected by Dr. W. L. Abbott. Original number 1215. Catalogued January 25, 1902.

Well-made skin in good condition; skull perfect.

Mus surifer flavidulus Miller.

Proc. Biol. Soc. Wash., XIII, p. 189, December 21, 1900.

104330. Skin and skull. Adult female. Pulo Lankawi, off west coast of Malay Peninsula. December 4, 1899. Collected by Dr. W. L. Abbott. Original number 109. Catalogued November 5, 1900.

Well-made skin in good condition; skull perfect.

Mus flaviventer Miller.

Proc. Wash. Acad. Sci., II, p. 204, August 20, 1900.

101739. Skin and skull. Adult male. Pulo Jimaja, Anamba Islands, South China Sea. September 18, 1899. Collected by Dr. W. L. Abbott. Catalogued January 20, 1900.

Well-made skin in good condition; skull perfect, except for loss of right malar.

Mus flebilis Miller.

Proc. U. S. Nat. Mus., XXIV, No. 1269, p. 762, pl. 41, fig. 2; pl. 42, figs. 2, 2*a*; May 28, 1902.

111841. Skin and skull. Adult female. Henry Lawrence Island, Andaman Islands. January 9, 1901. Collected by Dr. W. L. Abbott. Original number 827. Catalogued August 15, 1901.

Well-made skin in good condition; skull perfect.

Mus fremens Miller.

Proc. Acad. Nat. Sci. Phila., 1902, p. 154, June 11, 1902.

113087. Skin and skull. Adult male. Sinkep Island, Rhio-Linga Archipelago. September 4, 1901. Collected by Dr. W. L. Abbott. Original number 1273. Catalogued January 29, 1902.

Well-made skin in good condition; skull perfect.

Mus gilbiventer Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 35, November 6, 1903.

104153. Skin and skull. Adult male. Sullivan Island, Mergui Archipelago. February 2, 1900. Collected by Dr. W. L. Abbott. Original number 295. Catalogued November 3, 1900.

Well-made skin in good condition; skull perfect.

Mus arianus griseus True. Cotypes.

Proc. U. S. Nat. Mus., XVII, No. 976, p. 8, May 8, 1894.

No type is mentioned, so that the three following specimens designated by numbers, upon which the description of the species is based, are taken as cotypes. They were all collected by Dr. W. L. Abbott in Kashmir in 1891, prepared as skins and skulls. Catalogued May 9, 1892.

$\frac{20139}{35502}$. Adult female. Central Kashmir (8,500 feet), in pine forest. October 8, 1891.

Skin fairly well made, in good condition; skull has posterior and basal parts of brain case cut away.

$\frac{20144}{35507}$. Young adult male. Pir Panjal Range, Kashmir. August 31, 1891.

Skin fairly well made, in good condition; skull perfect.

$\frac{20151}{35514}$. Male, apparently young. Mountains of central Kashmir. September 13, 1891.

Skin fairly well made, in fairly good condition; skull can not be found.

Mus integer Miller.

Proc. Wash. Acad. Sci., III, p. 119, March 26, 1901.

104837. Skin and skull. Adult male. Sirhassen Island, Natuna Islands. June 7, 1900. Collected by Dr. W. L. Abbott. Original number 455. Catalogued December 19, 1900.

Well-made skin in good condition; skull perfect.

Mus julianus Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 34, November 6, 1903.

112393. Skin and skull. Adult female. St. Julian Island, South China Sea. June 2, 1901. Collected by Dr. W. L. Abbott. Original number 987. Catalogued November 11, 1901.

Well-made skin in good condition; skull perfect, except tip of nasals broken.

Mus kelleri Mearns.

Proc. U. S. Nat. Mus., XXVIII, No. 1402, p. 444, May 13, 1905.

125278. Skin and skull. Adult female. Davao, southern Min Philippine Islands. July 20, 1904. Collected by Dr. E. A. M U. S. A. Original number 5738. Catalogued December 13

Well-made skin in good condition; skull perfect, except for loss of pt and tip of left lower incisor.

Mus vociferans lancavensis Miller.

Proc. Biol. Soc. Wash., XIII, p. 188, December 21, 1900.

104173. Skin and skull. Adult female. Pulo Lankawi, of coast of Malay Peninsula. December 6, 1899. Collected W. L. Abbott. Original number 122. Catalogued Noven 1900.

Well-made skin in good condition; skull perfect.

Mus lingensis Miller.

Proc. Wash. Acad. Sci., II, p. 206, August 20, 1900.

101614. Skin and skull. Adult male. Linga Island, Rhio Archipelago. July 15, 1899. Collected by Dr. W. L. A Catalogued January 19, 1900.

Well-made skin in good condition, but pelage worn; skull perfect, ex loss of both malars, both pterygoids, and right upper incisor.

Mus lucas Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 30, November 6, 1903.

104190. Skin and skull. Adult female. St. Luke Island, I Archipelago. January 20, 1900. Collected by Dr. W. L. A Original number 253. Catalogued November 5, 1900.

Well-made skin in good condition; skull perfect.

Mus lugens Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 33, November 6, 1903.

121533. Skin and skull. Adult female. North Pagi Island, c coast of Sumatra. November 15, 1902. Collected by Dr. Abbott. Original number 2046. Catalogued July 29, 190

Well-made skin in good condition; skull perfect.

Mus luteolus Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 36, November 6, 1903.

104276. Skin and skull. Adult female. St. Matthew Islan gui Archipelago. January 15, 1900. Collected by Dr. Abbott. Original number 226. Catalogued November 5,

Well-made skin in good condition; skull perfect, except loss of right

Mus magnirostris Mearns.

Proc. U. S. Nat. Mus., XXVIII, No. 1402, p. 441, May 13, 1905.

125212. Skin and skull. Adult female. Zamboanga (old Spanish hospital), western Mindanao, Philippine Islands. January 15, 1904. Collected by Dr. E. A. Mearns, U. S. A. Original number 5639. Catalogued December 12, 1904.

Well-made skin in good condition; skull perfect, except for loss of left pterygoid.

Mus masæ Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 32, November 6, 1903.

121822. Skin and skull. Adult female. Tana Masa, Batu Islands, off west coast of Sumatra. February 21, 1903. Collected by Dr. W. L. Abbott. Original number 2327. Catalogued August 2, 1903.

Well-made skin in good condition; skull perfect.

Mus matthæus Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 29, November 6, 1903.

104159. Skin and skull. Adult male. St. Matthew Island, Mergui Archipelago. January 18, 1900. Collected by Dr. W. L. Abbott. Original number 243. Catalogued November 3, 1900.

Well-made skin in good condition; skull perfect, except that pterygoids are broken.

Mus mindanensis Mearns.

Proc. U. S. Nat. Mus., XXVIII, No. 1402, p. 442, May 13, 1905.

125274. Skin and skull. Adult male. Todaya (altitude 4,000 feet), Mount Apo, southern Mindanao, Philippine Islands. July 9, 1904. Collected by Dr. E. A. Mearns, U. S. A. Original number 5719. Catalogued December 13, 1904.

Fairly well-made skin in good condition; skull perfect, except that pterygoids are broken.

Mus obscurus Miller.

Proc. Wash. Acad. Sci., II, p. 213, August 20, 1900. Preoccupied by *Mus obscurus* Waterhouse. (Proc. Zool. Soc. London, V, p. 19, 1837.)

=**Mus pullus** Miller. Proc. Biol. Soc. Wash., XIV, p. 178, September 25, 1901.

101764. Skin and skull. Adult male. Pulo Tioman, off southeast coast of the Malay Peninsula. October 1, 1899. Collected by Dr. W. L. Abbott. Catalogued January 20, 1900.

Well-made skin in good condition, except tip of tail shriveled and a small bare spot on belly; skull perfect.

Mus pagensis Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 39, November 6, 1903.

121629. Skin and skull. Adult male. South Pagi Island, off west coast of Sumatra. December 23, 1902. Collected by Dr. W. L. Abbott. Original number 2153. Catalogued July 31, 1903.

Well-made skin in good condition; skull perfect.

Mus pannosus Miller.

Proc. Biol. Soc. Wash., XIII, p. 190, December 21, 1900.

104110. Skin and skull. Adult male. Pulo Adang, Butang Islands, west coast of Malay Peninsula. December 14, 1899. Collected by Dr. W. L. Abbott. Original number 146. Catalogued November 2, 1900.

Well-made skin in good condition; skull perfect.

Mus pantarensis Mearns.

Proc. U. S. Nat. Mus., XXVIII, No. 1402, p. 448, May 13, 1905.

123294. Skin and skull. Adult female. Pantar (altitude 1,907 feet), Mindanao, Philippine Islands. September 4, 1903. Collected by Dr. E. A. Mearns, U. S. A. Original number 5622. Catalogued January 28, 1904.

Fairly well-made skin in good condition; skull perfect, except that pterygoids and right coronoid process are broken away.

Mus pellax Miller.

Proc. Biol. Soc. Wash., XIII, p. 147, April 21, 1900.

86755. Skin and skull. Adult female. Khow Sai Dow (1,000 feet), Trong (or Tarang), lower Siam. February 5, 1899. Collected by Dr. W. L. Abbott. Catalogued July 19, 1899.

Well-made skin in good condition; skull perfect, except for loss of left malar and both pterygoids.

Mus pulliventer Miller.

Proc. U. S. Nat. Mus., XXIV, No. 1269, p. 765, pl. 41, fig. 3; pl. 42, figs. 3, 3a; May 28, 1902.

111790. Skin and skull. Adult female. Great Nicobar Island, Nicobar Islands. March 12, 1901. Collected by Dr. W. L. Abbott. Original number 927. Catalogued August 14, 1901.

Well-made skin in good condition; skull perfect, except for loss of left malar.

Mus tullbergi rostratus Miller.

Proc. Wash. Acad. Sci., II, p. 637, December 28, 1900.

83836. Skin and skull. Adult male. Mount Coffee (400 to 500 feet), Liberia, West Africa. May 7, 1897. Collected by R. P. Currie. Original number 60. Catalogued September 30, 1897.

Well-made skin in good condition; skull perfect.

Mus serutus Miller.

Proc. U. S. Nat. Mus., XXXI, No. 1481, p. 59, July 23, 1906.

125032. Skin and skull. Adult male. Pulo Serutu, Karimata Islands, off west coast of Borneo. August 17, 1904. Collected by Dr. W. L. Abbott. Original number 3590. Catalogued December 7, 1904.

Well-made skin in good condition; skull perfect.

Mus siantanicus Miller.

Proc. Wash. Acad. Sci., II, p. 210, fig. 11*b*, August 20, 1900.

101705. Skin and skull. Adult male. Pulo Siantan, Anamba Islands, South China Sea. September 11, 1899. Collected by Dr. W. L. Abbott. Catalogued January 19, 1900.

Fairly well-made skin in good condition; skull perfect, except for loss of both malars.

Mus simalurensis Miller.

Proc. U. S. Nat. Mus., XXVI, No. 1317, p. 458, February 3, 1903.

114216. Skin and skull. Adult female. Simalur Island, off west coast of Sumatra. December 14, 1901. Collected by Dr. W. L. Abbott. Original number 1372. Catalogued August 27, 1902.

Well-made skin in good condition; skull perfect.

Mus soccatus Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 30, November 6, 1903.

121549. Skin and skull. Adult male. North Pagi Island, off west coast of Sumatra. December 29, 1902. Collected by Dr. W. L. Abbott. Original number 2183. Catalogued July 29, 1903.

Well-made skin in good condition; skull perfect.

Mus stoicus Miller.

Proc. U. S. Nat. Mus., XXIV, No. 1269, p. 759, pl. 41, fig. 1; pl. 42, figs. 1, 1*a*, May 28, 1902.

111834. Skin and skull. Adult male. Henry Lawrence Island, Andaman Islands. January 9, 1901. Collected by Dr. W. L. Abbott. Original number 820. Catalogued August 15, 1901.

Well-made skin in good condition; skull slightly injured about the left pterygoid and left zygoma, left lower incisor broken off at alveolus, and left condyloid process lacking.

Mus strepitans Miller.

Proc. Wash. Acad. Sci., II, p. 207, August 20, 1900.

101697. Skin and skull. Adult female. Pulo Siantan, Anamba Islands, South China Sea. September 10, 1899. Collected by Dr. W. L. Abbott. Catalogued January 19, 1900.

Well-made skin in good condition; skull perfect.

Mus stridens Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 28, November 6, 1903.

104992. Skin and skull. Adult male. Tioman Island, off southeast coast of Malay Peninsula. October 10, 1900. Collected by Dr. W. L. Abbott. Original number 702. Catalogued January 2, 1901.

Well-made skin in good condition; skull perfect, except that it lacks the pterygoids.

Mus stridulus Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 29, November 6, 1903.

104196. Skin and skull. Adult female. Bentinck Island, Mergui Archipelago. March 12, 1900. Collected by Dr. W. L. Abbott. Original number 350. Catalogued November 5, 1900.

Well-made skin in good condition; skull perfect, except that the pterygoids are slightly injured.

Mus surdus Miller.

Proc. U. S. Nat. Mus., XXVI, No. 1317, p. 460, February 3, 1903.

114184. Skin and skull. Adult male. Simalur Island, off west coast of Sumatra. December 11, 1901. Collected by Dr. W. L. Abbott. Original number 1359. Catalogued August 26, 1902.

Well-made skin in good condition; skull perfect.

Mus surifer Miller.

Proc. Biol. Soc. Wash., XIII, p. 148, April 21, 1900.

86746. Skin and skull. Adult male. Khow Nok Ram (3,000 feet), Trong (or Tarang), lower Siam. January 14, 1899. Collected by Dr. W. L. Abbott. Catalogued July 19, 1899.

Well-made skin in good condition, save for a break in tail and some damage to left hind leg, probably from jaws of trap; skull perfect, except for injury to pterygoids.

Mus taciturnus Miller.

Proc. U. S. Nat. Mus., XXIV, No. 1269, p. 762, May 28, 1902.

111828. Skin and skull. Adult male. South Andaman Island, Andaman Islands. January 16, 1901. Collected by Dr. W. L. Abbott. Original number 854. Catalogued August 15, 1901.

Well-made skin in good condition; skull perfect.

Mus tagulayensis Mearns.

Proc. U. S. Nat. Mus., XXVIII, No. 1402, p. 439, May 13, 1905.

125264. Skin and skull. Adult male. At sea level, Tagulaya, Gulf of Davao, foot of Mount Apo, southern Mindanao, Philippine Islands. July 15, 1904. Collected by Dr. E. A. Mearns, U. S. A. Original number 5732. Catalogued December 13, 1904.

Well-made skin in good condition; skull perfect, except for loss of pterygoids and right zygoma.

Mus tambelanicus Miller.

Proc. Wash. Acad. Sci., II, p. 212, fig. 11c, August 20, 1900.

101665. Skin and skull. Adult male. Big Tambelan Island, South China Sea. August 10, 1899. Collected by Dr. W. L. Abbott. Catalogued January 19, 1900.

Well-made skin in good condition (tail met with an injury during life and is abnormally short); skull perfect, except for lack of right pterygoid.

Mus tana True.

Proc. U. S. Nat. Mus., XVI, No. 954, p. 602, October 25, 1893.

$\frac{21004}{36055}$. Skin, skull, and body in alcohol. Adult female. Along the Tana River, between the coast and Hameye, British East Africa. November, 1892. Collected by Hon. William Astor Chanler and Lieut. Ludwig von Höhnel. Catalogued July 21, 1893.

The specimen was originally in alcohol, but at the time the species was described it was made up into a skin, in good condition; skull perfect.

Mus tiomanicus Miller.

Proc. Wash. Acad. Sci., II, p. 209, fig. 11a, August 20, 1900.

101763. Skin and skull. Adult male. Pulo Tioman, off southeast coast of Malay Peninsula. October 4, 1899. Collected by Dr. W. L. Abbott. Catalogued January 20, 1900.

Well-made skin in good condition; skull perfect.

Mus todayensis Mearns.

Proc. U. S. Nat. Mus., XXVIII, No. 1402, p. 445, May 13, 1905.

125224. Skin and skull. Adult female. Todaya (altitude 4,000 feet), on Mount Apo, southern Mindanao, Philippine Islands. July 11, 1904. Collected by Dr. E. A. Mearns, U. S. A. Original number 5722. Catalogued December 21, 1904.

Well-made skin in good condition; skull perfect, except for lack of pterygoids.

Mus umbridorsum Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 37, November 6, 1903.

104227. Skin and skull. Adult male. Loughborough Island, Mergui Archipelago. January 24, 1900. Collected by Dr. W. L. Abbott. Original number 269. Catalogued November 5, 1900.

Well-made skin in good condition; skull perfect, except for lack of pterygoids.

Mus validus Miller.

Proc. Biol. Soc. Wash., XIII, p. 141, pl. 3, fig. 1; pl. 4, fig. 1, April 21, 1900.

86741. Skin and skull. Adult male. Khow Sai Dow (1,000 feet), Trong (or Tarang), lower Siam. February 18, 1899. Collected by Dr. W. L. Abbott. Catalogued July 19, 1899.

Well-made skin in good condition; skull perfect.

Mus vitiensis Peale. See page 289.

Mus vociferans Miller.

Proc. Biol. Soc. Wash., XIII, p. 138, pl. 3, fig. 3; pl. 4, fig. 3, April 21, 1900.

86736. Skin and skull. Adult male. Khow Sai Dow (1,000 feet), Trong (or Tarang), lower Siam. February 21, 1899. Collected by Dr. W. L. Abbott. Catalogued July 19, 1899.

Well-made skin in good condition; skull perfect.

Mus vulcani Mearns.

Proc. U. S. Nat. Mus., XXVIII, No. 1402, p. 446, May 13, 1905.

125216. Skin and skull. Adult male. Mount Apo (7,600 feet), southern Mindanao, Philippine Islands. June 26, 1904. Collected by Dr. E. A. Mearns, U. S. A. Original number 5674. Catalogued December 12, 1904.

Well-made skin in good condition; skull perfect except pterygoids and four occipital bones broken away.

Mus zamboangæ Mearns.

Proc. U. S. Nat. Mus., XXVIII, No. 1402, p. 443, May 13, 1905.

125279. Skin and skull. Adult male. Zamboanga, western Mindanao, Philippine Islands. January 20, 1904. Collected by Dr. E. A. Mearns, U. S. A. Original number 5753. Catalogued December 13, 1904.

Well-made skin in good condition, a spot without hair on rump and adjoining part of tail; skull perfect.

Genus CHIROPODOMYS.

Chiropodomys niadis Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 40, November 6, 1903.

121867. Skin and skull. Adult female. Lafau, Nias Island, off west coast of Sumatra. March 30, 1903. Collected by Dr. W. L. Abbott. Original number 2413. Catalogued August 2, 1903.

Well-made skin in good condition; skull perfect.

Genus LIMNOMYS.

Limnomys sibuanus Mearns.

Proc. U. S. Nat. Mus., XXVIII, No. 1402, p. 452, May 13, 1905.

125228. Skin and skull. Adult female. Mount Apo (altitude 6,600 feet), southern Mindanao, Philippine Islands. June 30, 1904. Collected by Dr. E. A. Mearns, U. S. A. Original number 5688. Catalogued December 12, 1904.

Well-made skin in good condition; skull perfect, except for lack of pterygoids.

Genus TARSOMYS.

Tarsomys apoensis Mearns.

Proc. U. S. Nat. Mus., XXVIII, No. 1402, p. 453, May 13, 1905.

125280. Adult male in alcohol, skull removed. Mount Apo (altitude 6,750 feet), southern Mindanao, Philippine Islands. July 5, 1904. Collected by Dr. E. A. Mearns, U. S. A. Original number 5706. Catalogued December 13, 1904.

Alcoholic in good condition; skull removed and perfect.

Genus APOMYS.

Apomys hylocœtes Mearns.

Proc. U. S. Nat. Mus., XXVIII, No. 1402, p. 456, May 13, 1905.

125246. Skin and skull. Adult female. Mount Apo (altitude 6,000 feet), southern Mindanao, Philippine Islands. Collected by Dr. E. A. Mearns, U. S. A. Original number 5696. Catalogued December 12, 1904.

Well-made skin in good condition; skull perfect, except that the pterygoids are missing.

Apomys insignis Mearns.

Proc. U. S. Nat. Mus., XXVIII, No. 1402, p. 459, May 13, 1905.

125230. Skin and skull. Adult female. Mount Apo (altitude 6,000 feet), southern Mindanao, Philippine Islands. July 8, 1904. Collected by Dr. E. A. Mearns, U. S. A. Original number 5711. Catalogued December 12, 1904.

Well-made skin in good condition; skull perfect, except for lack pterygoids and right coronoid process missing.

Apomys petræus Mearns.

Proc. U. S. Nat. Mus., XXVIII, No. 1402, p. 458, May 13, 1905.

125245. Skin and skull. Adult female. Mount Apo (altitude 7,600 feet), in southern Mindanao, Philippine Islands. June 30, 1904. Collected by Dr. E. A. Mearns, U. S. A. Original number 5690. Catalogued December 12, 1904.

Well-made skin in good condition; skull perfect, except for lack of pterygoids and malars.

Genus LENOTHRIX.

Lenothrix canus Miller.

Proc. U. S. Nat. Mus., XXVI, No. 1317, p. 466, pl. 18, February 3, 1903.

114386. Skin and skull. Adult male. Pulo Tuanku, west coast of Sumatra. January 27, 1902. Collected by Dr. W. L. Abbott. Original number 1477. Catalogued August 29, 1902.

Well-made skin in good condition; skull perfect.

Genus DASYMYS.

Dasymys rufulus Miller.

Proc. Wash. Acad. Sci., II, p. 639, fig. 40, December 28, 1900.

83844. Skin and skull. Adult male. Mount Coffee, Liberia, West Africa. March 30, 1897. Collected by R. P. Currie. Original number 19. Catalogued September 30, 1897.

Well-made skin in good condition; skull with a slight break in right zygoma; otherwise perfect.

Genus ARVICANTHIS.

Arvicanthis planifrons Miller.

Proc. Wash. Acad. Sci., II, p. 641, fig. 41*a*, December 28, 1900.

83814. Skin and skull. Adult male. Mount Coffee, Liberia, West Africa. April 26, 1897. Collected by R. P. Currie. Original number 46. Catalogued September 23, 1897.

Well-made skin in good condition except a small naked area on belly; skull perfect. The specimen was first preserved in alcohol, but shortly after coming to the Museum it was made into a skin.

Genus DENDROMYS.

Dendromys nigrifrons True.

Proc. U. S. Nat. Mus., XV, No. 915, p. 462, fig. 2, October 26, 1892.

$\frac{18783}{35263}$. Alcoholic, with skull removed. Adult female. Mount Kilimanjaro (5,000 feet), German East Africa. November, 1889. Collected by Dr. W. L. Abbott. Original number 10. Catalogued September 26, 1891.

Alcoholic in fair condition. A few small bare spots, and the under side extensively cut open to remove skull, but it has been recently sewed up; skull perfect.

No type designated by number. A skull is figured and marked "typical specimen." An examination of the 5 specimens collected by Dr. Abbott shows that the figured skull is No. 35263, consequently the specimen to which it belongs may be regarded as the type.

Genus GERBILLUS.

Gerbillus arenicolor Miller.

Proc. Biol. Soc. Wash., XIII, p. 163, October 31, 1900.

62153. Skin and skull. Adult male. In jungle on Yarkand River, east of Maralbashi, Eastern Turkestan. February 9, 1894. Collected by Dr. W. L. Abbott. Catalogued May 16, 1895.

Well-made skin in good condition; skull with left zygoma missing, otherwise perfect.

Type designated by number, which is given as 62143, an error for 62153.

Genus SPALAX.

Spalax berytensis Miller.

Proc. Biol. Soc. Wash., XVI, p. 162, November 30, 1903.

$\frac{13009}{36859}$. Skin and skull. Adult female. Beyrout, Syria. April, 1878. Collected by W. T. Van Dyck. Skin catalogued December 10, 1878; skull, June 26, 1894.

Fairly well-made skin in fair condition, a bare patch about chin and throat; skull perfect, except occipital bones broken away, both upper incisors and left lower incisor broken off to alveoli.

Spalax dolbrogeæ Miller.

Proc. Biol. Soc. Wash., XVI, p. 161, November 30, 1903.

122109. Skin and skull. Adult male. Malcociu near Tulchea, Dobrogea (or Dobruja), Roumania. March 20, 1903. Purchased from Wilhelm Schlüter, of Halle a. S., Germany. Catalogued August 22, 1903.

Well-made skin in good condition; skull nearly perfect; pterygoids slightly injured, as well as root caps of lower incisors.

Family MUSCARDINIDÆ.

Genus ELIOMYS.

Eliomys cincticauda Miller.

Proc. Biol. Soc. Wash., XIV, p. 39, April 25, 1901.

103030. Skin and skull. Adult male. Sorrento, near Naples, Italy. May 31, 1900. Collected by Dane Coolidge. Original number 1118. Catalogued September 28, 1900.

Well-made skin in good condition; skull perfect.

Eliomys parvus True.

Proc. U. S. Nat. Mus., XVI, No. 954, p. 601, October 25, 1893.

$\frac{21005}{36056}$. Skin and skull. Adult female. Along the Tana River, between the coast and Hameye, British East Africa. November, 1892. Collected by Hon. William Astor Chanler and Lieut. Ludwig von Höhnel. Catalogued July 21, 1893.

The specimen was originally in alcohol, but at the time the species was described it was made into a modern study skin, in good condition; skull perfect.

Family APLODONTIDÆ.

Genus APLODONTIA.

Aplodontia olympica Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XIII, p. 20, January 31, 1899.

89549. Skin and skull. Young adult male. Queniult Lake, Olympic Mountains, Washington. July 24, 1897. Collected by R. T. Young. Original number 309.

Well-made skin in good condition; skull perfect.

Aplodontia pacifica Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XIII, pp. 19–20, January 31, 1899.

77372. Skin and skull. Adult female. Newport, Oregon. March 26, 1896 (not March 20, as in original description). Collected by B. J. Bretherton. Original number 2219.

Well-made skin in good condition; skull perfect.

Aplodontia major rainieri Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XIII, p. 21, January 31, 1899.

90144. Skin and skull. Adult male. Paradise Creek, Mount Rainier, Washington. August 6, 1897. Collected by V. Bailey. Original number 6122.

Well-made skin in good condition; skull perfect.

Family CASTORIDÆ.

Genus CASTOR.

Castor canadensis frondator Mearns.

Preliminary Diagnoses of New Mammals of the Genera Sciurus, Castor, Neotoma, and Sigmodon from the Mexican Border of the United States, p. 2, March 5, 1897. (Reprinted in Proc. U. S. Nat. Mus., XX, No. 1132, p. 502, January 19, 1898.)

$\frac{20760}{35883}$. Skin and skull. Adult male. San Pedro River, Sonora, Mexico, near monument No. 98 of the Mexican boundary line. October 24, 1892. Collected by Dr. E. A. Mearns, U. S. A., and F. X. Holzner. Original number 2151. International Boundary Commission. Catalogued January 6, 1893.

Well-made skin, but rather overstuffed, in good condition; skull perfect.

Castor canadensis texensis Bailey. Biological Survey collection.

North. Amer. Fauna, No. 25, pp. 122–124, October 24, 1905.

135744. Skin and skull. Cummings Creek, Colorado County, Texas. December 25, 1900. Collected by F. Brune. Kept in captivity until January 10, 1901. Original number 5139x.

Skin folded and flattened, having been made over after mounting; rump, underparts, and nose largely bare or with scattered patches of underfur; right fore leg missing; nails of hind toes mostly broken or absent; skull lacks occipital condyles and most of supraoccipital; left pterygoid and upper incisors broken.

Family SCIURIDÆ.

Genus NANNOSCIURUS.

Nannosciurus bancanus Lyon.

Proc. Biol. Soc. Wash., XIX, p. 55, May 1, 1906.

124880. Skin and skull. Adult female. Klabat Bay, island of Banka, east of Sumatra. June 24, 1904. Collected by Dr. W. L. Abbott. Original number 3430. Catalogued December 3, 1904.

Well-made skin in good condition; skull perfect.

Nannosciurus borneanus Lyon.

Proc. Biol. Soc. Wash., XIX, p. 54, May 1, 1906.

142271. Skin and skull. Adult female. Sanggau, western Borneo. August 23, 1905. Collected by Dr. W. L. Abbott. Original number 4368. Catalogued January 20, 1906.

Well-made skin in good condition; skull perfect, except loss of left pm^1, and right pm^1, and pm^2.

Nannosciurus pulcher Miller.

Proc. Acad. Nat. Sci. Phila., 1902, p. 153, June 11, 1902.

113131. Skin and skull. Adult female. Sinkep Island, Rhio-Linga Archipelago. September 4, 1901. Collected by Dr. W. L. Abbott. Original number 1274. Catalogued January 31, 1902.

Well-made skin in good condition; skull badly injured; all the posterior part of the cranium missing; both nasals and all the ascending part of the left half of the mandible also missing.

Nannosciurus sumatranus Lyon.

Proc. Biol. Soc. Wash., XIX, p. 53, May 1, 1906.

141058. Skin and skull. Adult male. Tarussan Bay, west coast of Sumatra. January 16, 1905. Collected by Dr. W. L. Abbott. Original number 3946. Catalogued July 19, 1905.

Well-made skin in good condition; skull lacks posterior half of brain-case, and left pm^1, right pm^1, and left pm_1.

Genus MARMOTA.

Arctomys olympus Merriam. Biological Survey collection.

Proc. Acad. Nat. Sci. Phila., 1898, p. 352, August, 1898.

=**Marmota olympus** (Merriam). See Elliot, Check List of Mammals, etc., Field Columbian Mus., Zoöl. Ser., VI, p. 121, 1905.

90518. Skin and skull. Adult male. Head of Soleduck River, Olympic Mountains, Washington. August 27, 1897. Collected by Dr. C. Hart Merriam. Original number 6210 (V. Bailey).

Well-made skin in good condition; skull perfect.

Genus CYNOMYS.

Spermophilus gunnisoni Baird.

Proc. Acad. Nat. Sci. Phila., VII, p. 334, this paper was reported favorably for publication April 24, 1855.

=**Cynomys gunnisoni** (Baird). See Baird, Mammals of North America, p. 335, 1857.

$\frac{501}{1636}$. Skin (lost) and skull. Young adult. Cochetopa Pass, Saguache County, Colorado. September (first week), 1853. Collected by F. Kreutzfeldt, on expedition in charge of Capt. J. W. Gunnison,

U. S. A., and after his death in charge of Lieut. E. G. Beckwith, U. S. A. Original number 22. Catalogued February 20, 1855.

Skin can not now be found. Most of the skull is present, posterior part of the brain case lacking, last two molars in right half of mandible are missing, one detached bulla is present.

The type is not designated by number in the original description, but in the Mammals of North America it is specified by number.

Cynomys mexicanus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., VII, pp. 157-158, July 27, 1892.

$\frac{26483}{33836}$. Skin and skull. Adult male. La Ventura, Coahuila, Mexico. March 24, 1891. Collected by C. P. Streator. Original number 625.

Well-made skin in good condition; skull perfect, except for absence of right upper premolar.

Genus CITELLUS.

Citellus plesius ablusus Osgood. Biological Survey collection.

Proc. Biol. Soc. Wash., XVI, pp. 25-26, March 19, 1903.

119815. Skin and skull. Adult male. Nushagak, Alaska. September 16, 1902. Collected by W. H. Osgood and A. G. Maddren. Original number 2043.

Well-made skin in good condition; skull perfect.

Citellus adocetus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XVI, pp. 79-80, May 29, 1903.

126129. Skin and skull. Adult female. La Salada, Michoacan, Mexico. March 17, 1903. Collected by E. W. Nelson and E. A. Goldman. Original number 16183.

Well-made skin in good condition ; skull perfect.

Spermophilus tridecemlineatus alleni Merriam. Biol. Surv. coll.

Proc. Biol. Soc. Wash., XII, p. 71, March 24, 1898.

=**Citellus tridecemlineatus alleni** (Merriam). See Trouessart, Catalogus Mammalium, Suppl., p. 341, 1904.

56050. Skin and skull. Adult male. West slope of Bighorn Mountains, Wyoming; altitude 8,000 feet. September 18, 1893. Collected by V. Bailey. Original number 4383.

Well-made skin in good condition ; skull perfect.

Spermophilus spilosoma annectens Merriam. Biological Survey coll.

Proc. Biol. Soc. Wash., VIII, pp. 132-133, December 28, 1893.

=**Citellus spilosoma annectens** (Merriam). See Trouessart, Catalogus Mammalium, Suppl., p. 340, 1904.

$\frac{30410}{42396}$. Skin and skull. Young adult male. Padre Island, Texas. August 24, 1891. Collected by W. Lloyd. Original number 694.

Well-made skin in good condition; skull perfect, except for absence of left postorbital process.

Spermophilus spilosoma arens Bailey. Biological Survey coll.

Proc. Biol. Soc. Wash., XV, p. 118, June 2, 1902.

=**Citellus spilosoma arens** (Bailey). See Miller and Rehn, Proc. Bost. Soc. Nat. Hist., XXXI, p. 75, August, 1903.

64977. Skin and skull. Adult male. El Paso, Texas. May 10, 1894. Collected by Dr. A. K. Fisher. Original number 1446.

Well-made skin in good condition; skull perfect, except for absence of left audital bulla.

Spermophilus armatus Kennicott. Cotypes.

Proc. Acad. Nat. Sci. Phila., 1863, p. 158, ordered published June 30, 1863.

=**Citellus armatus** (Kennicott). See Elliot, Check List Mammals North Amer. Cont., etc., Field Columbian Mus., Zool. Ser., VI, p. 112, 1905.

No numbers are mentioned in the original description. Kennicott briefly describes new spermophiles in the collection of the Smithsonian Institution, collected by C. Drexler at Fort Bridger, Utah, now Wyoming. Consequently, all the specimens from Fort Bridger collected by C. Drexler and in the collection prior to 1863 are evidently cotypes of the species. In the following list are included all the known specimens from Fort Bridger collected by Drexler. The labels all have *armatus* written on them, possibly in Kennicott's own hand, and they are entered in the catalogue as *Spermophilus armatus*. The skins were all collected in April to June of 1858, and the alcoholics were probably taken at the same time.

$\frac{3463}{4809}$. Female. Skin, can not be found; anterior half of skull and mandible present. Original number 454. Collected May 26, 1858.

3464. Female. Very poor skin, torn in two; part of skull inside. Original number 728. Collected June 25, 1858.

$\frac{3466}{4808}$. Male. Skin, can not be found; anterior half of skull and of mandible present. Original number 610.

3467. Male. Skin, can not be found; no record of a skull. Original number 261. Collected May 2, 1858.

3470. Female. Skin, can not be found; no record of a skull. Original number 455. Collected May 26, 1858.

$\frac{3472}{4799}$. Skin and skull; neither can be found. Original number 167. Collected April 11, 1858.

3474. Skin, can not be found; no record of a skull. Original number 215. Collected April 14, 1858.

3475. Male. Skin, can not be found; no record of a skull. Original number 197. Collected April 14, 1858.

3476. Female. Very poor skin, torn in two: two loose detached legs present; part of skull inside. Original number 229. Collected April 15, 1858.

3478. Male. Skin, can not be found; no record of a skull. **Original** number 140. Collected April 2, 1858.

3481. Skin, can not be found; no record of a skull. **Original number** 375. Collected May 19, 1858.

5958. Alcoholic, can not be found.

5959. Alcoholic, can not be found.

5960. Alcoholic, can not be found.

$\frac{4221}{4794}$. Skin; can not be found; anterior half of skull and right half of mandible present. Remarks in catalogue say, "Died at S. I., after two years' confinement," so that it was probably collected at the time the others were taken and brought to Washington alive.

3463–3481. Skins. Catalogued March 3, 1859.

5958–5960. Alcoholics. Catalogued February 5, 1863.

4221. Skin. Catalogued October 27, 1860.

All the skulls catalogued January 20, 1863.

Spermophilus barrowensis Merriam.

Proc. Wash. Acad. Sci., II, p. 19, March 14, 1900.

=**Citellus barrowensis** (Merriam). See Allen, Bull. Amer. Mus. Nat. Hist., XIX p. 141, March 31, 1903.

$\frac{14061}{37824}$. Skin and skull. Adult male. Point Barrow, Alaska. May 30, 1883. Collected by Lieut. P. L. Rae, U. S. A. Original number 1428. Skin catalogued January 16, 1884; skull December 4, 1899.

Well-made skin in good condition; skull perfect, except for loss of coronoid process of right half of mandible.

Spermophilus beringensis Merriam.

Proc. Wash. Acad. Sci., II, p. 20, March 14, 1900.

=**Citellus beringensis** (Merriam). See Elliot, Check List Mammals North Amer. Cont., etc., Field Columbian Mus., Zool. Ser., VI, p. 110, 1905.

15253. Skin; no skull. Adult male. Cape Lisburne (coal veins), Alaska. May, 1885. Collected by H. D. Wolfe. Catalogued December 3, 1885.

Fairly well-made skin in good condition.

Spermophilus canescens Merriam. Biological Survey collection.

North Amer. Fauna, No. 4, p. 38, October 8, 1890.

=**Citellus canescens** (Merriam). See Trouessart, Catalogus Mammalium, Suppl., p. 341, 1904.

$\frac{17873}{24810}$. Skin and skull. Immature male. Willcox, Cochise County, Arizona. November 16, 1889. Collected by V. Bailey. Original number 676.

Well-made skin in good condition; skull perfect.

Spermophilus mollis canus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XII, pp. 70–71, March 24, 1898.

=**Citellus mollis canus** (Merriam). See Trouessart, Catalogus Mammalium, Suppl. p. 339, 1904.

78681. Skin and skull. Adult female. Antelope, Wasco County, Oregon. June 21, 1896. Collected by V. Bailey. Original number 5561.

Well-made skin in good condition; skull perfect.

Spermophilus couchi Baird.

Proc. Acad. Nat. Sci. Phila., VII, p. 332, this paper was reported favorably for publication April 24, 1855.

=**Citellus variegatus couchi** (Baird). See Bailey, North Amer. Fauna, No. 25, p. 83, October 24, 1905.

$\frac{338}{1255}$. Skin and skull. Santa Catarina (not on modern maps; see Baird, Mammals of North America, p. 713), a few miles west of Monterey, Nuevo Leon, Mexico. April, 1853. Collected by Lieut. D. N. Couch, U. S. A. Catalogued December 20, 1854.

The specimen was formerly mounted, but it has recently been made a study skin, in fair condition. Some hair has slipped from the underparts. Instead of being the "glossy black" described by Baird, it is now a blackish brown, probably due to exposure to light and consequent bleaching. Skull has left malar, left incisors, and the posterior parts involving the occipital bones, and left bulla, wanting.

Type not designated by number, but the measurements given in the original description agree exactly with those of No. $\frac{338}{1255}$ given by Baird in Mammals of North America, p. 312.

Spermophilus cryptospilotus Merriam. Biol. Survey collection.

North Amer. Fauna, No. 3, pp. 57–58, pl. 9, figs. 1–3, September 4, 1890.

=**Citellus cryptospilotus** (Merriam). See Trouessart, Catalogus Mammalium, Suppl., p. 341, 1904.

$\frac{17676}{24612}$. Skin and skull. Adult male. Tenebito Wash, Painted Desert Arizona. August 17, 1889. Collected by Dr. C. Hart Merriam. Original number 374.

Well-made skin in good condition; skull perfect, except for slight break in supraorbital border.

Spermophilus elegans Kennicott. Cotypes.

Proc. Acad. Nat. Sci. Phila., 1863, p. 158, ordered published at meeting of June 30, 1863.

=**Citellus elegans** (Kennicott). See Elliot, Check List Mammals North Amer. Cont., etc., Field Columbian Mus., Zool. Ser., VI, p. 113, 1905.

No numbers are mentioned in the original description. Kennicott briefly describes new spermophiles in the collection of the Smithsonian Institution. He speaks of *Spermophilus elegans* as coming from Fort Bridger, Utah (now Wyoming), and collected by

C. Drexler. Consequently all the specimens from Fort Bridger collected by C. Drexler and in the collection prior to 1863 become cotypes of the species. In the following list are included all the known specimens from Fort Bridger collected by Drexler. The labels all have *elegans* written on them, possibly in Kennicott's hand, and they are entered in the catalogue as *Spermophilus elegans*. The skins were collected in April and May of 1858 and the alcoholics were probably taken at the same time.

$\frac{3468}{4796}$. Female. Skin, can not be found; skull, anterior half present and in fair condition; mandible lost. Original number 168. Collected April 11, 1858.

3469. Female. Very poor skin; no record of a skull. Original number 169. Collected April 11, 1858.

3473. Male. Skin, can not be found; no record of a skull. Original number 166. Collected April 11, 1858.

$\frac{3479}{4810}$. Female. Well-made skin in good condition (remade in February, 1902); skull has most of mandible and upper tooth row and orbit of right side present. Original number 233. Collected April 17, 1858.

3480. Male. Very poor skin with part of skull inside. Original number 216. Collected April 14, 1858.

4003. Female. Very poor skin; has been mounted; fragmentary skull inside. Original number 3.

$\frac{5950}{4814}$. Skin in alcohol; condition good; skull in good condition.

5951. Alcoholic; abdominal viscera removed; condition fair.

5952. Alcoholic; abdominal viscera removed; condition fair.

5953. Alcoholic; abdominal viscera removed; condition good.

5954. Alcoholic; abdominal viscera removed; young; condition poor.

5955. Body without feet or head, in alcohol; also a poor skin which has been mounted.

5956. Alcoholic; abdominal viscera removed; condition fair.

5957. Body without feet or head, in alcohol; no skin can be found.

Skins Nos. 3468-3480; catalogued March 3, 1859; No. 4003, June 18, 1860; alcoholic material in February, 1863; skulls January 20, 1863.

Spermophilus beecheyi fisheri Merriam. Biological Survey coll.

Proc. Biol. Soc. Wash., VIII, pp. 133-134, December 28, 1893.

=**Citellus grammurus fisheri** (Merriam). See Trouessart, Catalogus Mammalium, Suppl., p. 336, 1904.

$\frac{20318}{41386}$. Skin and skull. Adult male. Kern Valley, 25 miles above Kernville, California. July 6, 1891. Collected by Dr. A. K. Fisher. Original number 741.

Well-made skin in good condition, except for absence of a small patch of hair on the side of the abdomen; skull perfect.

Spermophilus annulatus goldmani Merriam. Biological Survey coll.

Proc. Biol. Soc. Wash., XV, p. 69, March 22, 1902.

=**Citellus annulatus goldmani** (Merriam). See Miller and Rehn, Proc. Bost. Soc. Nat. Hist., XXXI, p. 74, August, 1903.

91259. Skin and skull. Adult female. Santiago, Tepic, Mexico. June 18, 1897. Collected by E. W. Nelson and E. A. Goldman. Original number 11223.

Well-made skin in good condition; skull perfect, except for small perforation in squamosal.

Spermophilus spilosoma macrospilotus Merriam. Biol. Survey coll.

North Amer. Fauna, No. 4, p. 38, October 8, 1890.

=**Citellus spilosoma macrospilotus** (Merriam). See Trouessart, Catalogus Mammalium, Suppl., p. 340, 1904.

$\frac{16750}{23663}$. Skin and skull. Adult female. Oracle, Pinal County, Arizona. June 11, 1889. Collected by V. Bailey. Original number 129.

Well-made skin in good condition; skull perfect, except for small perforation in brain-case.

Spermophilus spilosoma major Merriam. Biological Survey coll.

North Amer. Fauna, No. 4, p. 39, October 8, 1890.

=**Citellus spilosoma major** (Merriam). See Trouessart, Catalogus Mammalium, Suppl., p. 340, 1904.

$\frac{17116}{24049}$. Skin and skull. Adult female. Albuquerque, New Mexico. July 22, 1889. Collected by V. Bailey. Original number 225.

Well-made skin in good condition; skull perfect, except for absence of left postorbital process and slight injuries to left zygoma, nasals, and right auditory meatus.

Spermophilus spilosoma marginatus Bailey. Biol. Survey coll.

Proc. Biol. Soc. Wash., XV, p. 118, June 2, 1902.

=**Citellus spilosoma marginatus** (Bailey). See Miller and Rehn, Proc. Bost. Soc. Nat. Hist., XXXI, p. 75, August, 1903.

108927. Skin and skull. Adult male. Alpine, Texas. July 5, 1901. Collected by V. Bailey. Original number 7702.

Well-made skin in good condition; skull perfect, except for several small shot perforations; left coronoid and condyle missing.

Spermophilus mollis Kennicott. Cotypes.

Proc. Acad. Nat. Sci. Phila., 1863, p. 157, ordered published at meeting of June 30, 1863.

=**Citellus mollis** (Kennicott). See Elliot, Check List Mammals North Amer. Cont., etc., Field Columbian Mus., Zool. Ser., VI, p. 112, 1905.

$\frac{3777}{4798}$. Skin and skull. Camp Floyd, Utah (now near Fairfield). March 18, 1859. Collected by C. S. McCarthy during "explora-

tions with the army in Utah" under Capt. J. H. Simpson, U. S. A. Original number 164. Skin catalogued February 21, 1860, skull, January, 1863.

Skin remade in February, 1902, in good condition. The skull has most of the brain-case lacking, otherwise it is in good condition.

3775. Skin. Another cotype from the same place and by the same collector, can not be found. Catalogued February 21, 1860.

No type is designated by Kennicott. The specimens are referred to as coming from Camp Floyd and the Rocky Mountains in Utah, and collected by C. Drexler and C. S. McCarthy. The above two specimens are the only ones that fulfill these requirements. Nos. $\frac{4272}{5012}$ and 4953 are catalogued as coming from the Rocky Mountains and doubtfully collected by Drexler. In view of this uncertainty in regard to the Rocky Mountain specimens, it seems best to restrict the cotypes to the Camp Floyd specimens, which is the better course, since it gives the species a definite type-locality. Camp Floyd is considered the type-locality by Miller and Rehn, Proc. Bost. Soc. Nat. Hist., XXX, p. 53, December, 1901.

Citellus nebulicola Osgood.

Proc. Biol. Soc. Wash., XVI, p. 26, March 19, 1903.

59145. Skin and skull. Adult female. Nagai Island, Shumagin Islands, Alaska. June 24, 1893. Collected by C. H. Townsend. Catalogued February 5, 1895.

Fairly well-made skin in good condition; skull perfect.

Spermophilus spilosoma obsidianus Merriam. Biol. Survey coll.

North Amer. Fauna, No. 3, pp. 56–57, September 4, 1890.

=Citellus spilosoma obsidianus (Merriam). See Elliot, Check List Mammals North Amer. Cont., etc., Field Columbian Mus., Zool. Ser., VI, p. 100, 1905.

$\frac{17674}{24610}$. Skin and skull. Adult male. Cedar belt northeast of San Francisco Mountain, Arizona. October 1, 1889. Collected by V. Bailey. Original number 557.

Well-made skin in fair condition; underparts somewhat grease-stained; skull perfect, except for perforation in supraoccipital.

Spermophilus obsoletus Kennicott. Cotypes.

Proc. Acad. Nat. Sci. Phila., 1863, p. 157, ordered published at meeting of June 30, 1863.

=Citellus obsoletus (Kennicott). See Elliot, Check List Mammals North Amer. Cont., etc., Field Columbian Museum, Zool. Ser., VI, p. 99, 1905.

No type is designated in the description. The species is based upon specimens in the collection of the Smithsonian Institution, from "Nebraska" (including the present Nebraska, Wyoming, and Dakotas), collected by Doctors Suckley, Cooper, and Hayden. The following seven specimens answer to these requirements and are undoubtedly the ones Kennicott had. This leaves the type-locality rather indefinite. It is the general region of the present western Nebraska.

3140. Skin. Male. Fort Laramie, Wyoming, formerly Nebraska Territory. Collected September 22, 1857, by Dr. J. G. Cooper. Original number 62. Skin lost.

$\frac{3144}{4813}$. Skin and skull. Fort Laramie, Wyoming, formerly Nebraska Territory. September 30, 1857. Collected by Dr. J. G. Cooper. Original number 67. Skin lost. Most of skull present but badly broken.

$\frac{3222}{37998}$. Skin. Female. Fifty miles west of Fort Kearney, Nebraska. August 9, 1857. Collected by Dr. J. G. Cooper. Original number 44. Fair skin, remade February, 1902. Skull in fair condition; broken about the brain case posteriorly.

3223. Skin. Female. One hundred and twenty miles west of Fort Kearney, Nebraska. August 16, 1857. Collected by Dr. J. G. Cooper. Original number 45. Skin lost.

$\frac{3224}{4811}$. Skin and skull. Female. One hundred and thirty miles west of Fort Kearney, Nebraska. August 17, 1857. Collected by Dr. J. G. Cooper. Original number 47. Poor skin; most of skull present, but it is broken in two across the brain case.

3225. Skin. Male. Same data as 3224. Original number 48. Wretched skin, without feet; part of skull inside.

$\frac{3252}{4795}$. Skin and skull. Black Hills, South Dakota, formerly Nebraska Territory. Collected by Dr. F. V. Hayden. Neither skin nor skull can be found.

Skins catalogued 1857–1858; skulls in 1863, except No. 37998, catalogued in February, 1902.

Spermophilus oregonus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XII, p. 69, March 24, 1898.

=**Citellus oregonus** (Merriam). See Elliot, Check List Mammals North Amer. Cont., etc., Field Columbian Mus., Zool. Ser., VI, p. 113, 1905.

89177. Skin and skull. Adult female. Swan Lake Valley, Klamath Basin, Oregon. June 12, 1897. Collected by V. Bailey. Original number 6005.

Well-made skin in good condition; skull perfect, except for several small shot perforations.

Spermophilus osgoodi Merriam.

Proc. Wash. Acad. Sci., II, p. 18, March 14, 1900.

=**Citellus osgoodi** (Merriam). See Elliot, Check List Mammals North Amer. Cont., etc., Field Columbian Museum, Zool. Ser., VI, p. 110, 1905.

$\frac{12789}{37822}$. Skin and skull. Adult male. Fort Yukon, Alaska. April 29, 1877. Collected by Lucien M. Turner. Original number 1635. Skin catalogued November 15, 1877; skull, December 4, 1899.

Well-made skin in good condition. Most of the brain-case of the skull has been broken away; left zygomatic arch complete, right broken away; both upper incisors broken off to the roots; left half of mandible perfect, the parts posterior to the molars of the right half of mandible broken off.

Spermophilus mexicanus parvidens Mearns.

Preliminary Diagnoses of New Mammals from the Mexican Border of the United States, p. 1, March 25, 1896. (Reprinted in Proc. U. S. Nat. Mus., XVIII, No. 1075, May 23, 1896, p. 443.)

=**Citellus mexicanus parvidens** (Mearns). See Stone and Rehn, Proc. Acad. Nat. Sci. Phila., 1903, p. 21, May 7, 1903.

63073. Skin and skull. Adult male. Fort Clark, Kinney County, Texas. March 21, 1893. Collected by Dr. E. A. Mearns, U. S. A. Original number 2312. Catalogued January 14, 1896.

Well-made skin in good condition; skull perfect, except for an irregular hole in top of brain-case.

Spermophilus perotensis Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., VIII, pp. 131–132, December 28, 1893.

=**Citellus perotensis** (Merriam). See Elliot, Mamms. Middle Amer. and W. I., Field Columbian Mus., Zool. Ser., IV, p. 145, 1904.

54274. Skin and skull. Adult female. Perote, Vera Cruz, Mexico. June 8, 1893. Collected by E. W. Nelson. Original number 4976.

Well-made skin in good condition; skull perfect.

Spermophilus empetra plesius Osgood. Biological Survey coll.

North Amer. Fauna, No. 19, pp. 29–30, October 6, 1900.

=**Citellus plesius** (Osgood). See Osgood, Proc. Biol. Soc. Wash., XVI, p. 25, March 19, 1903.

98931. Skin and skull. Adult female. Bennett, head of Lake Bennett, British Columbia. June 19, 1899. Collected by W. H. Osgood. Original number 465.

Well-made skin in good condition; skull perfect.

Spermophilus spilosoma pratensis Merriam. Biol. Survey coll.

North Amer. Fauna, No. 3, pp. 55–56, September 4, 1890.

=**Citellus spilosoma pratensis** (Merriam). See Elliot, Check List Mammals North Amer. Cont., etc., Field Columbian Mus., Zool. Ser., VI, p. 100, 1905.

$\frac{17659}{24595}$. Skin and skull. Adult female. Pine plateau at north base of San Francisco Mountain, Arizona. August 5, 1889. Collected by Dr. C. Hart Merriam and V. Bailey. Original number 285.

Well-made skin in good condition; skull perfect.

Citellus stejnegeri Allen.

Bull. Amer. Mus. Nat. Hist., XIX, p. 142, March 31, 1903.

63226. Skin and skull. Male (?), young. Near Petropaulski, southeastern Kamchatka. 1895. Collected by Dr. L. Stejneger. Catalogued March 27, 1896.

Flat skin; all parts present and apparently in good condition; skull nearly perfect; permanent premolars not yet in place; slightly injured about left zygoma and left pterygoid, a hole in supraoccipital.

Spermophilus mollis stephensi Merriam. Biological Survey coll.

Proc. Biol. Soc. Wash., XII, pp. 69–70, March 24, 1898.

=**Citellus mollis stephensi** (Merriam). See Elliot, Check List Mammals North Amer. Cont., etc., Field Columbian Mus., Zool. Ser., VI, p. 112, 1905.

29492/41667. Skin and skull. Adult male. Queen Station, near head of Owens Valley, Esmeralda County, Nevada. July 12, 1891. Collected by F. Stephens. Original number 718.

Well-made skin in good condition; skull perfect, except for absence of first left upper premolar and slightly injured left pterygoid and angular process of mandible.

Spermophilus tereticaudus Baird. Cotypes.

Mammals of North America, p. 315, pl. 67, fig. 2, head and feet, probably No. 2490; pl. 81, fig. 4, skull No. 2419, 1857.

=**Citellus tereticaudus** (Baird). See Elliot, Field Columbian Museum, Zool. Ser., III, p. 211, 1904.

No type is designated by Baird. The description is apparently equally based upon these three specimens, which are specified by number:

1584/2419. Skin and skull. A not fully adult male. Skin in bad condition; most of hair on the posterior half of body, except the legs and tail, is lacking; skull pefect, except the two small upper premolars lacking.

1585. Skin of the head and neck. The body is said to be in alcohol, but can not be found.

2490. A young female in alcohol. All the hair behind the shoulders, except that on the feet and tail, has sloughed off.

All the specimens were collected at Fort Yuma, Arizona, by Maj. G. H. Thomas, U. S. A. Skins catalogued June 24, 1856, the alcoholic, April 9, 1857.

Spermophilus mollis yakimensis Merriam. Biological Survey coll.

Proc. Biol. Soc. Wash., XII, p. 70, March 24, 1898.

=**Citellus mollis yakimensis** (Merriam). See Elliot, Check List Mammals North Amer. Cont., etc., Field Columbian Mus., Zool. Ser., VI, p. 112, 1905.

89331. Skin and skull. Adult male. Mabton, Yakima County, Washington. July 16, 1897. Collected by Dr. W. K. Fisher. Original number 323.

Well-made skin in good condition; skull perfect.

Genus AMMOSPERMOPHILUS.

Tamias leucurus cinnamomeus Merriam. Biological Survey coll.

North Amer. Fauna, No. 3, pp. 51–53, September 4, 1890.

=**Ammospermophilus leucurus cinnamomeus** (Merriam). See Mearns, Bull. U. S. Nat. Mus., No. 56, Pt. 1, p. 299, April 13, 1907.

$\frac{17987}{24898}$. Skin and skull. Adult female. Echo Cliffs, Painted Desert, Arizona. September 22, 1889. Collected by Dr. C. Hart Merriam and V. Bailey. Original number 510.

Well-made skin in good condition; skull perfect, except for fractured basioccipital and supraoccipital.

Tamias interpres Merriam. **Biological Survey collection.**

North Amer. Fauna, No. 4, pp. 21–22, October 8, 1890.

=**Ammospermophilus leucurus interpres** (Merriam). See Mearns, Bull. U. S. Nat. Mus., No. 56, Pt. 1, p. 301, April 13, 1907.

$\frac{18162}{25060}$. Skin and skull. Adult female. El Paso, Texas. December 10, 1889. Collected by V. Bailey. Original number 762.

Well-made skin in good condition; skull perfect.

Spermophilus nelsoni Merriam. **Biological Survey collection.**

Proc. Biol. Soc. Wash., VIII, pp. 129–131, December 28, 1893.

=**Ammospermophilus nelsoni** (Merriam).

54651. Skin and skull. Adult male. Tipton, Tulare County, California. June 24, 1893. Collected by C. P. Streator. Original number 2968.

Well-made skin in good condition; skull perfect.

Spermophilus harrisi saxicolus Mearns.

Preliminary Diagnoses of New Mammals from the Mexican Border of the United States, p. 2, March 25, 1896. (Reprinted in Proc. U. S. Nat. Mus., XVIII, No. 1075, p. 444, May 23, 1896.)

=**Ammospermophilus harrisi saxicola** (Mearns). See Mearns, Bull. U. S. Nat. Mus., No. 56, Pt. 1, p. 306, April 13, 1907.

59869. Skin and skull. Adult female. Tinajas Altas, Gila Mountains, Yuma County, Arizona. February 17, 1894. Collected by Dr. E. A. Mearns, U. S. A., and F. X. Holzner. Original number 2983. Catalogued April 12, 1894.

Well-made skin in good condition; skull perfect.

Genus CALLOSPERMOPHILUS.

Spermophilus chrysodeirus brevicaudus Merriam.

Biological Survey collection.

Proc. Biol. Soc. Wash., VIII, p. 134, December 28, 1893. Preoccupied by *Spermophilus brevicauda* Brandt (Bull. Acad. St. Petersburg, 1844, II. p. 369).

Spermophilus bernardinus Merriam. Science, new ser., VIII, p. 782, December 2, 1898.

=**Callospermophilus bernardinus** (Merriam). See Mearns, Bull. U. S. Nat. Mus., No. 56, Pt. 1, p. 313, April 13, 1907.

56661. Skin and skull. Adult female. San Bernardino Peak, California. October 9, 1893. Collected by J. E. McLellan. Original number 274.

Well-made skin in good condition; skull perfect, except for small perforation [illegible]asals and broken angular processes of mandible.

Tamias castanurus Merriam. Biological Survey collection.

North Amer. Fauna, No. 4, p. 19, October 8, 1890.

=**Callospermophilus castanurus** (Merriam).

$\frac{22733}{30197}$. Skin and skull. Adult male. Park City, Summit County, Utah. July 3, 1890. Collected by V. Bailey. Original number 1383.

Well-made skin in good condition; skull perfect, except for a few small shot perforations.

Callospermophilus madrensis Merriam. Biological Survey coll.

Proc. Wash. Acad. Sci., III, p. 563, November 29, 1901.

95363. Skin and skull. Adult female. Sierra Madre, near Guadalupe y Calvo, Chihuahua, Mexico. August 27, 1898. Collected by E. W. Nelson and E. A. Goldman. Original number 12923.

Well-made skin in good condition; skull perfect, except for absence of last right upper molar.

Callospermophilus chrysodeirus trinitatis Merriam.
Biological Survey collection.

Proc. Biol. Soc. Wash., XIV, p. 126, July 19, 1901.

95531. Skin and skull. Adult female. Trinity Mountains east of Hoopa Valley, California. September 10, 1898. Collected by V. Bailey. Original number 6693.

Well-made skin in good condition; skull perfect.

Genus EUTAMIAS.

Tamias alpinus Merriam. Biological Survey collection.

Proc. Bioi. Soc. Wash., VIII, pp. 137–138, December 28, 1893.

=**Eutamias alpinus** (Merriam). See Merriam, *op. cit.*, XI, p. 191, July 1, 1897.

$\frac{30507}{42491}$. Skin and skull. Young adult female. Big Cottonwood Meadows, near Mount Whitney, California; altitude 10,000 feet. August 12, 1891. Collected by Dr. B. H. Dutcher, U. S. A. Original number 191.

Well-made skin in good condition; skull perfect.

Eutamias pallidus cacodemus Cary. Biological Survey collection.

Proc. Biol. Soc. Wash., XIX, pp. 89–90, June 4, 1906.

138737 (not 138137, as in original description). Skin and skull. Young adult male. Sheep Mountain, Big Badlands, South Dakota. September 2, 1905. Collected by M. Cary. Original number 682.

Well-made skin in good condition; skull perfect.

Tamias callipeplus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., VIII, pp. 136–137, December 28, 1893.

=**Eutamias speciosus callipeplus** (Merriam). See Merriam, *op. cit.*, XI, p. 202, July 1, 1897.

$\frac{31289}{43164}$. Skin and skull. Young adult male. Summit of Mount Pinos, Ventura County, California; altitude 9,000 feet. October 20, 1891. Collected by E. W. Nelson. Original number 1344.

Well-made skin in good condition; skull perfect, except for slight break in supraorbital border.

Eutamias canicaudus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XVI, p. 77, May 29, 1903.

$\frac{27007}{34428}$. Skin and skull. Adult female. Spokane, Washington. April 11, 1891. Collected by C. P. Streator. Original number 639.

Well-made skin in good condition; skull perfect.

Eutamias caniceps Osgood. Biological Survey collection.

North Amer. Fauna, No. 19, pp. 28–29, October 6, 1900.

99200. Skin and skull. Adult female. Lake Lebarge, Yukon, Canada. July 13, 1899. Collected by W. H. Osgood. Original number 603.

Well-made skin in good condition; skull perfect.

Eutamias cinereicollis canipes Bailey. Biological Survey coll.

Proc. Biol. Soc. Wash., XV, p. 117, June 2, 1902.

109229. Skin and skull. Adult female. Guadalupe Mountains, Texas. August 24, 1901. Collected by V. Bailey. Original number 7827.

Well-made skin in good condition; skull perfect, except for broken tip of nasals and absence of right coronoid process of mandible.

Eutamias minimus caryi Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XXI, p. 143, June 9, 1908.

150740. Skin and skull. Young adult male. Medano Ranch, San Luis Valley, Colorado. October 24, 1907. Collected by M. Cary. Original number 1176.

Well-made skin in good condition; skull perfect.

Eutamias caurinus Merriam. Biological Survey collection.

Proc. Acad. Nat. Sci. Phila., 1898, pp. 352–353, October 4, 1898.

90636. Skin and skull. Adult male. Timber line near head of Soleduck River, Olympic Mountains, Washington. August 27, 1897. Collected by Dr. C. Hart Merriam. Original number 6211 (V. Bailey).

Well-made skin in good condition; skull perfect.

Tamias cinereicollis Allen. Biological Survey collection.

Bull. Amer. Mus. Nat. Hist., III, pp. 94–96, June, 1890.

=**Eutamias cinereicollis** (Allen). See Miller and Rehn, Proc. Bost. Soc. Nat. Hist., XXX, p. 40, December, 1901.

$\frac{17597}{24633}$. Skin and skull. Adult female. San Francisco Mountain, Arizona. August 2, 1889. Collected by Dr. C. Hart Merriam and V. Bailey. Original number 260 (V. Bailey).

Well-made skin in good condition; skull perfect, except for absence of right postorbital process.

Tamias cooperi Baird. Cotype.

Proc. Acad. Nat. Sci. Phila., VII, p. 334, this paper was reported favorably for publication April 24, 1855.

=**Eutamias cooperi** (Baird). See Lyon, Smithsonian Miscell. Coll., L, No. 1713, p. 89, June 27, 1907.

$\frac{212}{1183}$. Skin and skull. Klickitat Pass, Cascade Mountains (4,500 feet), Skamania County, Washington. (See Cooper, American Naturalist, II, p. 531; Baird's published statements regarding the locality are inaccurate.) July, 1853. Collected by Dr. J. G. Cooper. Skin catalogued January 30, 1854; skull October, 1853.

Skin is well preserved, and in June, 1902, was remade into a modern study skin. The posterior half of the brain-case and right zygoma lacking.

No. $\frac{211}{1183}$ is another cotype, having the same data as the above, but it can not be found.

No type is designated in the original description, but on page 301, Mammals North America, Baird refers to Nos. 211 and 212 as the ones he had in view when *Tamias cooperi* was first described.

Tamias dorsalis Baird. Cotypes.

Proc. Acad. Nat. Sci. Phila., VII, p. 332, this paper was reported favorably for publication April 24, 1855.

=**Eutamias dorsalis** (Baird). See Merriam, Proc. Biol. Soc. Wash., XI, p. 210, July 1, 1897.

120. Mounted specimen (which has a skull inside). Fort Webster, copper mines of the Mimbres River; lat. 32°, 47′, long. 108°, 04′. Near the present Georgetown, Grant county, New Mexico. 1851. Collected by J. H. Clark. Catalogued March 31, 1853.

In fair condition. Some skin is broken about the chin and about right fore leg, and tip of tail is missing.

$\frac{119}{3151}$. Data as above. Skin catalogued March 31, 1853; skull, April 10, 1857. Only the mandible of this specimen can be fonnd.

These specimens were designated by number by Baird as the basis of *Tamias dorsalis* on page 300 of the Mammals of North America, 1857.

Tamias callipeplus Merriam.

Proc. Biol. Soc. Wash., VIII, p

=Eutamias speciosus callipeplu
July 1, 1897.

$\frac{31989}{43184}$. Skin and skull. Y
Pinos, Ventura County,
20, 1891. Collected by

Well-made skin in good
supraorbital border.

Eutamias canicaudus M

Proc. Biol. Soc. Wash., V

$\frac{27001}{32425}$. Skin and skull.
11, 1891. Collecte

Well-made skin in g

Eutamias caniceps

North Amer. Fauna

99200. Skin and
Canada. July
number 603.

Well-made s

Eutamias cine

Proc. Biol. S

109229. Skin
Texas. A
number 7

Well-ma
and absen

Eutamias

Proc. Bi

150740.
Luis V
Origi

We

Eutam

P

...en.
... Hist., III, pp. 70–71, June, 1890.
...Allen). See Miller and Rehn, Proc. Bost. Soc. Nat. Hist., ...ber 27, 1901.

...ll. Adult female. San Pedro Martir Mountains, ..., Mexico. May 1, 1889. Collected by C. H. ...ginal number 7. Catalogued January 21, 1890.

...n good condition, but no wire in tail; skull perfect.

...ndi ochrogenys Merriam. Biological Survey coll.
...Wash., XI, pp. 195, 206–207, July 1, 1897.

...skull. Adult male. Mendocino, California. July ...llected by J. E. McLellan. Original number 1015.

...in in good condition; skull perfect, except for absence of post-...and first left upper premolar.

...enus operarius Merriam. Biological Survey coll.
...c. Wash., XVIII, pp. 164–165, June 29, 1905.

... and skull. Young adult female. Gold Hill, Colorado. ..., 1903. Collected by V. Bailey. Original number 8160.

...le skin in good condition; skull perfect.

...oreocetes Merriam. Biological Survey collection.
...l. Soc. Wash., XI, pp. 207–208, July 1, 1897.

...in and skull. Adult female. Timber line, near Summit, Mountains, Montana. June 14, 1895. Collected by V. ... Original number 5024.

...made skin in good condition; skull perfect.

... quadrivittatus pallidus Allen. Lectotype.
... Bost. Soc. Nat. Hist., XVI, p. 289, 1874.
...amias pallidus (Allen). See Cary, Proc. Biol. Soc. Wash., XIX, p. 87, June 4, ...06.

...¼. Skin and skull. Nearly adult. Camp Thorne (near present ...wn of Glendive), Yellowstone River, Montana. July 18, 1873. ...ollected by Dr. J. A. Allen. Original number 200. Skin cata-...ogued January 1874; skull, May 18, 1906.

Skin originally had skull inside, but in 1906 the skull was removed and the specimen made into a modern study skin, now in good condition. The skull lacks all the occipital bones and one bulla; otherwise in good condition.

For regarding this specimen a lectotype out of a series of cotypes from widely separated localities and representing more than one form, see Cary, Proc. Biol. ...c. Wash., XIX, p. 88, under "Remarks."

Eutamias palmeri Merriam. **Biological Survey collection.**

Proc. Biol. Soc. Wash., XI, pp. 208–210, July 1, 1897.

$\frac{26076}{33481}$. Skin and skull. Adult male. Charleston Peak, Nevada. February 13, 1891. Collected by Dr. T. S. Palmer and E. W. Nelson. Original number 432.

Well-made skin in good condition; skull perfect.

Tamias panamintinus Merriam. **Biological Survey collection.**

Proc. Biol. Soc. Wash., VIII, pp. 134–135, December 28, 1893.

=**Eutamias panamintinus** (Merriam). See Merriam, *op. cit.*, XI, p. 191, July 1, 1897.

$\frac{27603}{35702}$. Skin and skull. Adult male. Panamint Mountains, Inyo County, California. April 3, 1891. Collected by E. W. Nelson. Original number 723.

Well-made skin in good condition; skull perfect.

Eutamias senescens Miller.

Proc. Acad. Nat. Sci. Phila., 1898, p. 349, October 4, 1898.

83395. Skin and skull. Adult female. Low barren hills, 15 miles west of Peking, China. August 21, 1896. Collected by George D. Wilder. Catalogued March 6, 1897.

Well-made skin in good condition; skull perfect, except that right posterior half of brain-case is broken away.

Genus TAMIOPS.

Sciurus novemlineatus Miller.

Proc. Biol. Soc. Wash., XVI, p. 147, November 12, 1903.

=**Tamiops novemlineatus** (Miller).

84403. Skin and skull. Adult male. One thousand five hundred feet elevation in heavy forest among the hills of Trong (or Tarang), lower Siam. February 19, 1897. Collected by Dr. W. L. Abbott. Catalogued March 25, 1898.

Well-made skin in good condition; skull perfect, except that the left ramus of mandible is lacking.

Genus SCIURUS.

Sciurus abbotti Miller.

Proc. Wash. Acad. Sci., II, p. 224, August 20, 1900.

101662. Skin and skull. Adult female. Big Tambelan Island, Tambelan Islands, South China Sea. August 10, 1899. Collected by Dr. W. L. Abbott. Catalogued January 19, 1900.

Well-made skin in good condition; skull perfect.

Sciurus adangensis Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 17, November 6, 1903.

104389. Skin and skull. Adult male. Pulo Adang, Batu Islands, off west coast of Sumatra. December 14, 1899. Collected by Dr. W. L. Abbott. Original number 153. Catalogued November 6, 1900.

Well-made skin in good condition; skull perfect.

Sciurus alleni Nelson. Biological Survey collection.

Proc. Biol. Soc. Wash., XII, pp. 147–148, June 3, 1898.

$\frac{25731}{33131}$. Skin and skull. Adult male. Monterey, Nuevo Leon, Mexico. February 22, 1891. Collected by C. P. Streator. Original number 563.

Well-made skin in good condition; skull perfect.

Sciurus altinsularis Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 21, November 6, 1903.

111975. Skin and skull. Adult female. High Island, Mergui Archipelago. December 31, 1900. Collected by Dr. W. L. Abbott. Original number 810. Catalogued August 20, 1901.

Well-made skin in good condition; skull perfect.

Sciurus anambensis Miller.

Proc. Wash. Acad. Sci., II, p. 223, August 20, 1900.

101686. Skin and skull. Adult female. Pulo Siantan, Anamba Islands, South China Sea. September 12, 1899. Collected by Dr. W. L. Abbott. Catalogued January 19, 1900.

Well-made skin in good condition; skull perfect.

Sciurus fossor anthonyi Mearns.

Preliminary Diagnoses of New Mammals of the Genera Sciurus, Castor, Neotoma, and Sigmodon, from the Mexican Border of the United States, p. 1, March 5, 1897. (Reprinted in Proc. U. S. Nat. Mus., XX, No. 1132, p. 501, January 19, 1898.)

60928. Skin and skull. Adult female. Campbell's ranch, Laguna, San Diego County, California. June 10, 1894. Collected by Dr. E. A. Mearns, U. S. A. Original number 3642. Catalogued November 14, 1894.

Well-made skin in good condition; skull perfect, except for a few shot holes in brain-case.

Sciurus aoris Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 10, November 6, 1903.

112418. Skin and skull. Adult female. Pulo Aor, off the coast of Johore. June 5, 1901. Collected by Dr. W. L. Abbott. Original number 1002. Catalogued November 12, 1901.

Well-made skin in good condition; skull perfect, except for two shot holes on superior surface and one just above right bulla.

Sciurus arizonensis Coues.

Amer. Nat., I, p. 357, footnote, September, 1867.

$\frac{8475}{37607}$. Skin and skull. Female. Fort Whipple, Arizona. December 20, 1865. Collected by Dr. Elliott Coues. Skin catalogued April 16, 1866; skull, November 1, 1898.

Specimen has evidently been mounted, but it has been made into a good study skin. The floor of the brain-case has been broken out, otherwise the skull is complete.

In the catalogue, No. 8475 is recorded as having been collected on December 6, 1864. Dr. Coues says (*loc. cit.*): The only specimen he obtained was shot December 20, 1865. Dr. Allen, in his list, on page 741, Monographs of North American Rodentia, gives the same date, probably taken from Coues, who was working with him, or from an original label which is now lost. Dr. Coues refers to no number as type in his description, but Dr. Allen, ten years later, in table (*loc. cit.*), under "Remarks," states that specimen no. 8475 is the type of *S. arizonensis.*

In the skull catalogue under "Remarks" is written: "Skull taken from mounted type, not naturally attached to skin, and it is very doubtful if it is the type skull. Oct. 31/98."

Sciurus atratus Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 13, November 6, 1903.

121524. Skin and skull. Adult female. North Pagi Island, off west coast of Sumatra. November 22, 1902. Collected by Dr. W. L. Abbott. Original number 2087. Catalogued July 29, 1903.

Well-made skin in good condition; skull perfect.

Sciurus hudsonicus baileyi Allen. Biological Survey collection.

Bull. Amer. Mus. Nat. Hist., X, pp. 261–262, July 22, 1898.

56040. Skin and skull. Adult male. West slope of Bighorn Mountains, Wyoming. 8,400 feet altitude. September 19, 1893. Collected by V. Bailey. Original number 4390.

Well-made skin in good condition; skull perfect.

Sciurus balæ Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 14, November 6, 1903.

121799. Skin and skull. Adult male. Tana Bala, Batu Islands, west coast Sumatra. February 12, 1903. Collected by Dr. W. L. Abbott. Original number 2282. Catalogued August 2, 1903.

Well-made skin in good condition, but tail was damaged during life and only 23 mm. remain; skull perfect, except loss of left small upper premolar and second right lower molar and left angular process of mandible.

Sciurus yucatanensis baliolus Nelson. Biological Survey collection.

Proc. Biol. Soc. Wash., XIV, p. 131, August 9, 1901.

107939. Skin and skull. Adult male. Apazote, Campeche, Mexico. January 8, 1901. Collected by E. A. Goldman. Original number 14428.

Well-made skin in good condition; skull perfect, except for broken mandible; posterior portion of right ramus missing; left ramus broken, but with teeth and processes intact.

Sciurus bancarus Miller.

Proc. U. S. Nat. Mus., XXVI, No. 1317, p. 451, February 3, 1903.

114311. Skin and skull. Adult male. Pulo Bangkaru, Banjak Islands, off west coast of Sumatra. January 17, 1902. Collected by Dr. W. L. Abbott. Original number 1422. Catalogued August 28, 1902.

Well-made skin in good condition; skull perfect, except both small upper premolars lacking.

Sciurus boothiæ belti Nelson. Biological Survey collection.

Proc. Wash. Acad. Sci., I, pp. 78–79, pl. 2, figs. 1, 5, May 9, 1899.

$\frac{36473}{48847}$. Skin and skull. Adult female. Escondido River, 50 miles from Bluefields, Nicaragua. October 12, 1892. Collected by Dr. C. W. Richmond. Original number 124.

Well-made skin in good condition; skull perfect, except for a few shot perforations.

Sciurus bentincanus Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 19, November 6, 1903.

104383. Skin and skull. Adult female. Bentinck Island, Mergui Archipelago. March 11, 1900. Collected by Dr. W. L. Abbott. Original number 349. Catalogued November 6, 1900.

Well-made skin in good condition; skull perfect.

Sciurus bilimitatus Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 8, November 6, 1903.

105072. Skin and skull. Adult female. Tanjong Laboha, Tringanu, Malay Peninsula. September 29, 1900. Collected by C. Boden Kloss. Original number (Dr. W. L. Abbott) 671. Catalogued January 4, 1901.

Well-made skin in good condition; skull perfect, except for shot holes in base and vault of cranium.

Sciurus billitonus Lyon.

Proc. U. S. Nat. Mus., XXXI, No. 1498, p. 592, December 18, 1906.

124977. Skin and skull. Adult female. Buding Bay, Billiton Island, between Sumatra and Borneo. August 5, 1904. Collected by Dr. W. L. Abbott. Original number 3539. Catalogued December 6, 1904.

Well-made skin in good condition; skull perfect.

Sciurus carimatæ Miller.

Proc. U. S. Nat. Mus., XXXI, No. 1481, p. 57, July 23, 1906.

125076. Skin and skull. Adult male. Telok Pai, Karimata Island, off west coast of Borneo. August 27, 1904. Collected by Dr. W. L. Abbott. Original number 3662. Catalogued December 8, 1904.

Well-made skin in good condition; skull perfect, except slight injury to right condyloid process of mandible.

Sciurus carimonensis Miller.

Proc. U. S. Nat. Mus., XXXI, No. 1485, p. 261, September 11, 1906.

122800. Skin and skull. Adult female. Great Karimon Island, Rhio-Linga Archipelago. May 24, 1903. Collected by Dr. W. L. Abbott. Original number 2423. Catalogued January 20, 1904.

Well-made skin in good condition; skull nearly perfect, a few small shot injuries.

Sciurus douglasii cascadensis Allen. Biological Survey collection.

Bull. Amer. Mus. Nat. Hist., X, pp. 277–278, July 22, 1898.

80229. Skin and skull. Adult male. Mount Hood, Oregon. September 9, 1896. Collected by V. Bailey. Original number 5874.

Well-made skin in good condition; skull perfect, except for a few small shot perforations.

Sciurus casensis Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 20, November 6, 1903.

104370. Skin and skull. Adult female. Chance Island, Mergui Archipelago. December 28, 1899. Collected by Dr. W. L. Abbott. Original number 185. Catalogued November 6, 1900.

Well-made skin in good condition; skull perfect.

Sciurus castanotus Baird.

Proc. Acad. Nat. Sci. Phila., VII, p. 332, reported favorably for publication April 24, 1855 (typographical error for *castanonotus*). *Sciurus castanonotus* Baird, Mammals of North America, p. 266, 1857.

=**Sciurus aberti** Woodhouse. See Allen, Monographs North American Rodentia, p. 735, 1877.

$\frac{121}{1107}$. Skin and skull. Adult female. Coppermines, near the present site of Georgetown, Grant County, New Mexico. (On page 707 of Mammals of North America, Baird says of Coppermines, "A former station of the United States-Mexican Boundary Survey, subsequently called Fort Webster. Not indicated clearly whether on a tributary of the Gila or Mimbres. About latitude 33°, longitude 108°." In his original description the specimen is spoken

of as coming from the Mimbres. 1851. Collected by J. H. Clark. Catalogued March 31, 1853.

The specimen has evidently been made over into a modern study skin, quite complete except for the tail, which is rather fragmentary; skull perfect.

No numbers are referred to in the original description, but in the Mammals of North America it is seen that there were two specimens, an adult female and a young. Measurements of a skull are given in the first description, which apply to the adult female, no. $\frac{121}{1107}$. Hence it is regarded as the type.

Sciurus griseoflavus chiapensis Nelson. Biological Survey coll.

Proc. Wash. Acad. Sci., I, pp. 69–70, May 9, 1899.

75957. Skin and skull. Adult male. San Cristobal, Chiapas, Mexico. September 22, 1895. Collected by E. W. Nelson and E. A. Goldman. Original number 8447.

Well-made skin in good condition; skull perfect.

Sciurus socialis cocos Nelson. Biological Survey collection.

Proc. Biol. Soc. Wash., XII, pp. 155–156, June 3, 1898.

70644. Skin and skull. Adult male. Acapulco, Guerrero, Mexico. January 11, 1895. Collected by E. W. Nelson and E. A. Goldman. Original number 7360.

Well-made skin in good condition; skull perfect, except for broken right audital bulla.

Sciurus albipes colimensis Nelson. Biological Survey collection.

Proc. Biol. Soc. Wash., XII, p. 152, June 3, 1898.

=**Sciurus poliopus colimensis** (Nelson). See Nelson, Proc. Wash. Acad. Sci., I, p. 52, May 9, 1899.

$\frac{33197}{45202}$. Skin and skull. Adult male. Hacienda Magdalena, Colima, Mexico. March 19, 1892. Collected by E. W. Nelson and E. A. Goldman. Original number 2239.

Well-made skin in good condition; skull perfect.

Sciurus aberti concolor True.

Diagnoses of New North American Mammals, p. 1, April 26, 1894. (Reprinted in Proc. U. S. Nat. Mus., XVII, No. 999, p. 241, November 15, 1894.) Preoccupied by *Sciurus concolor* Blyth (Journ. Asiat. Soc. Bengal XXIV, p. 474, 1855.)

=**Sciurus aberti ferreus** True. Proc. Biol. Soc. Wash., XIII, p. 183, November 30, 1900.

$\frac{21423}{36281}$. Skin and skull. Adult female. Loveland, Larimer County, Colorado. Collected by William G. Smith. Catalogued October 30, 1893.

Skin in good condition, but not made up in form of a modern study skin; skull perfect, except for a few minor chippings.

Sciurus condurensis Miller.

Proc. U. S. Nat. Mus., XXXI, No. 1485, p. 260, September 11, 1906.

122876. Skin and skull. Adult female. Pulo Kundur, Rhio-Linga Archipelago. June 13, 1903. Collected by Dr. W. L. Abbott. Original number 2486. Catalogued January 21, 1904.

Well-made skin in good condition; skull nearly perfect, left zygoma lacking and last left upper molar shot away.

Sciurus domelicus Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 18, November 6, 1903.

104381. Skin and skull. Adult female. Domel Island, Mergui Archipelago. February 24, 1900. Collected by Dr. W. L. Abbott. Original number 322. Catalogued November 6, 1900.

Well-made skin in good condition; skull perfect.

Sciurus dorsalis Woodhouse.

Proc. Acad. Nat. Sci. Phila., VI, p. 110, reported favorably for publication June 29, 1852. (Name preoccupied; see Gray, Proc. Zool. Soc. Lond., 1848, p. 138.)

=**Sciurus aberti** Woodhouse. Proc. Acad. Nat. Sci. Phila., VI, p. 220, requested to be published December 28, 1852.

2430. Skin, no skull. San Francisco Mountain, Arizona, on the routes of Captains Sitgreaves and Whipple, about lat. 35° and long. 111° 30′. October, 1851. Collected by Dr. S. W. Woodhouse. Catalogued April 4, 1857.

The specimen was formerly mounted, but it has since been taken down and made into a fairly good study skin. The first description reads: "This beautiful squirrel I procured whilst attached to the expedition under the command of Capt. L. Sitgreaves, Topographical Engineer, U. S. Army, exploring the Zuni and the Great and Little Colorado rivers of the West in the month of October, 1851, in the San Francisco Mountain, New Mexico." This statement makes it practically certain that the above specimen is the one on which Dr. Woodhouse based his description.

Sciurus albipes effugius Nelson. Biological Survey collection.

Proc. Biol. Soc. Wash., XII, pp. 152–153, June 3, 1898.

=**Sciurus poliopus effugius** (Nelson). See Nelson, Proc. Wash. Acad. Sci., I, p. 54, May 9, 1899.

70288. Skin and skull. Adult female. Mountains near Chilpancingo, Guerrero, Mexico. December 24, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 7271.

Well-made skin in good condition; skull perfect, except for broken alisphenoid.

Sciurus erebus Miller.

Proc. U. S. Nat. Mus., XXVI, No. 1317, p. 456, February 3, 1903.

=**Sciurus piceus** Peters. See Lyon, Proc. U. S. Nat. Mus., XXXIV, No. 1626, p. 638, 1908.

114537. Skin and skull. Adult female. Tapanuli Bay, west coast of Sumatra. March 17, 1902. Collected by Dr. W. L. Abbott. Original number 1653. Catalogued September 2, 1902.

Well-made skin in good condition; skull perfect.

Sciurus fossor Peale. See page 290.

Sciurus aureogaster frumentor Nelson. Biological Survey coll.

Proc. Biol. Soc. Wash., XII, pp. 154–155, June 3, 1898.

54259. Skin and skull. Adult male. Las Vigas, Vera Cruz, Mexico. June 18, 1893. Collected by E. W. Nelson and E. A. Goldman. Original number 5073.

Well-made skin in good condition; skull perfect, except for absence of last two right upper molars and last left upper molar.

Sciurus goldmani Nelson. Biological Survey collection.

Proc. Biol. Soc. Wash., XII, pp. 149–150, June 3, 1898.

77903. Skin and skull. Adult male. Huehuetan, Chiapas, Mexico. February 28, 1896. Collected by E. W. Nelson and E. A. Goldman. Original number 9435.

Well-made skin in good condition; skull perfect.

Sciurus hippurellus Lyon.

Smithsonian Miscell. Coll., L, No. 1705, p. 27, fig. 12*b*, April 8, 1907.

142274. Skin and skull. Adult female. Batu Ampar, Landak River, western Borneo. July 11, 1905. Collected by Dr. W. L. Abbott. Original number 4260. Catalogued January 20, 1906.

Well-made skin in good condition; skull perfect, except loss of two minute upper premolars.

Sciurus hippurosus Lyon.

Smithsonian Miscell. Coll., L, No. 1705, p. 26, fig. 12*a*, April 8, 1907.

141031. Skin and skull. Adult female. Tarussan Bay, west coast of Sumatra. December 18, 1904. Collected by Dr. W. L. Abbott. Original number 3826. Catalogued July 19, 1905.

Well-made skin in good condition; skull with a few shot holes in cranium, most of the left half of the mandible destroyed by shot, and right lower incisor shot off at alveolus.

Sciurus nelsoni hirtus Nelson. Biological Survey collection.

Proc. Biol. Soc. Wash., XII, pp. 153–154, June 3, 1898.

55325. Skin and skull. Adult male. Tochimilco, Puebla, Mexico. August 7, 1893. Collected by E. W. Nelson and E. A. Goldman. Original number 5295.

Well-made skin in good condition; skull perfect, except for broken pterygoids.

Sciurus ictericus Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 12, November 6, 1903.

121727. Skin and skull. Adult female. Tana Bala, Batu Islands, off west coast Sumatra. February 4, 1903. Collected by Dr. W. L. Abbott. Original number 2223. Catalogued August 1, 1903.

Well-made skin in good condition; skull perfect.

Sciurus (Microsciurus) isthmius Nelson.

Bull. Amer. Mus. Nat. Hist., XII, p. 77, fig. 1, April 14, 1899.

$\frac{3399}{37344}$. Skin and skull. Truando River, northwestern Colombia. Collected by Dr. A. Schott. Original number 232. Received from Lieut. N. Michler, U. S. A. Skin catalogued March 1, 1859; skull, March 25, 1898.

Skin in rather poor condition, tail imperfect; most of the posterior basal portion of the brain case of the skull has been cut away.

Sciurus kaibabensis Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XVII, pp. 129–130, June 9, 1904.

130982. Skin and skull. Adult male. Bright Angel Creek, top of Kaibab Plateau, Grand Canyon, Arizona. December 1, 1903. Collected by J. T. Stewart. Original number 4470x.

Well-made skin in good condition; skull with zygomata, pterygoids, left audital bulla, and angular processes of mandible broken.

Sciurus klossi Miller.

Proc. Wash. Acad. Sci., II, p. 225, fig. 13*b*, August 20, 1900.

101678. Skin and skull. Adult male. Kaju Ara, or Saddle Island, of the Tambelan Islands, South China Sea. August 15, 1899. Collected by Dr. W. L. Abbott. Catalogued January 19, 1900.

Well-made skin in good condition; skull perfect.

Sciurus lancavenis Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 16, November 6, 1903.

104390. Skin and skull. Adult male. Pulo Lankawi, off west coast of Malay Peninsula. December 1, 1899. Collected by Dr. W. L. Abbott. Original number 101. Catalogued November 6, 1900.

Well-made skin in good condition; skull perfect.

Sciurus lautensis Miller.

Proc. Wash. Acad. Sci., III, p. 128, March 26, 1901.

104683. Skin and skull. Adult female. Pulo Laut, Natuna Islands. August 6, 1900. Collected by Dr. W. L. Abbott. Original number 612. Catalogued December 17, 1900.

Well-made skin in good condition; skull perfect, except posterior portion of left half of mandible has been shot away.

Sciurus (Heliosciurus) rufobrachiatus libericus Miller.

Proc. Wash. Acad. Sci., II, p. 633, December 28, 1900.

83834. Skin and skull. Adult male. Mount Coffee, Liberia, West Africa. March 22, 1897. Collected by R. P. Currie. Original number 16. Catalogued September 30, 1897.

Well-made skin in good condition; skull perfect.

Sciurus limitis Baird.

Proc. Acad. Nat. Sci. Phila., VII, p. 331, this paper was reported favorably for publication April 24, 1855.

=**Sciurus niger limitis** (Baird). See Osgood, Proc. Biol. Soc. Wash., XX, p. 45 April 18, 1907.

$\frac{351}{1266}$. Skin (lost) and skull. Devils River, Texas. Collected by J. H. Clark, United States and Mexican Boundary Survey, under Maj. W. H. Emory, U. S. A. Catalogued December 12, 1854.

Skin can not be found; skull perfect, except for loss of left pterygoid and a small piece out of left angular process of mandible.

The original description says, "Collected by J. H. Clark on Devil's River, Texas," and by referring to Baird's Mammals of North America, p. 256, it is seen, that this specimen is no. $\frac{351}{1265}$, which is consequently considered the type.

Sciurus lingungensis Miller.

Proc. Wash. Acad. Sci., III, p. 123, March 26, 1901.

104693. Skin and skull. Adult male. Pulo Lingung, off the southern extremity of Bunguran Island, Natuna Islands. June 19, 1900. Collected by Dr. W. L. Abbott. Original number 494. Catalogued December 17, 1900.

Well-made skin in good condition; skull perfect.

Sciurus socialis littoralis Nelson. Biological Survey collection.

Proc. Biol. Soc. Wash., XX, pp. 87–88, December, 1907.

71322. Skin and skull. Adult female. Puerto Angel, Oaxaca, Mexico. March 11, 1895. Collected by E. W. Nelson and E. A. Goldman. Original number 7627.

Well-made skin in good condition; skull perfect, except for absence of two molars, left pterygoid, and adjacent part of the floor of the brain-case.

Sciurus lucas Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 20, November 6, 1903.

104385. Skin and skull. Adult female. St. Luke Island, Mergui Archipelago. January 20, 1900. Collected by Dr. W. L. Abbott. Original number 256. Catalogued November 6, 1900.

Well-made skin in good condition; skull perfect, except that the right pterygoid is defective.

Sciurus lutescens Miller.

Proc. Wash. Acad. Sci., III, p. 124, March 26, 1901.

104668. Skin and skull. Adult male. Sirhassen Island Natuna Islands. June 3, 1900. Collected by Dr. W. L. Abbott. Original number 429. Catalogued December 17, 1900.

Well-made skin in good condition; skull perfect.

Sciurus boothiæ managuensis Nelson.

Proc. Biol. Soc. Wash., XIII, p. 150, June 3, 1898.

=**Sciurus managuensis** (Nelson). See Nelson, Proc. Wash. Acad. Sci., I, p. 81, May 9, 1899.

62476. Skin and skull. Adult male. Along the Managua River, Guatemala. February 12, 1895. Collected by Mrs. C. McElroy. Catalogued June 26, 1895.

Well-made skin in good condition; skull perfect.

Sciurus mansalaris Miller.

Proc. U. S. Nat. Mus., XXVI, No. 1317, p. 451, February 3, 1903.

114633. Skin and skull. Adult male. Pulo Mansalar, off Tapanuli Bay, west coast of Sumatra. March 2, 1902. Collected by Dr. W. L. Abbott. Original number 1583. Catalogued September 3, 1902.

Well-made skin in good condition; skull perfect.

Sciurus matthæus Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 19, November 6, 1903.

111920. Skin and skull. Adult female. St. Matthew Island, Mergui Archipelago. December 11, 1900. Collected by Dr. W. L. Abbott. Original number 774. Catalogued August 17, 1901.

Well-made skin in good condition; skull perfect.

Sciurus hudsonius mearnsi Townsend.

Proc. Biol. Soc. Wash., XI, p. 146, June 9, 1897.

=**Sciurus mearnsi** (Townsend). See Allen, Bull. Amer. Mus. Nat. Hist., X, p. 286, July 22, 1898.

$\frac{18266}{25170}$. Skin and skull. San Pedro Martir Mountains, at about 7,000 feet, Lower California, Mexico. May, 1889. Collected by C. H. Townsend. Catalogued February 15, 1890.

Well-made skin in good condition; skull perfect.

Sciurus melanops Miller.

Proc. Acad. Nat. Sci. Phila., 1902, p. 151, June 11, 1902.

113152. Skin and skull. Adult female. Indragiri River, eastern Sumatra. September 15, 1901. Collected by Dr. W. L. Abbott. Original number 1307. Catalogued February 3, 1902.

Well-made skin in good condition; skull perfect, except for loss of both minute upper premolars.

Sciurus mendanauus Lyon.

Proc. U. S. Nat. Mus., XXXI, No. 1498, p. 589, December 18, 1906.

124916. Skin and skull. Adult male. Pulo Mendanau, west coast of Billiton Island, between Sumatra and Borneo. July 14, 1904. Collected by Dr. W. L. Abbott. Original number 3475. Catalogued December 5, 1904.

Well-made skin in good condition; skull perfect.

Sciurus mimellus Miller.

Proc. Wash. Acad. Sci., II, p. 218, August 20, 1900.

101668. Skin and skull. Adult male. Pulo Wai, Tambelan Islands, South China Sea. August 13, 1899. Collected by Dr. W. L. Abbott. Catalogued January 19, 1900.

Well-made skin in good condition; skull perfect.

Sciurus mimiculus Miller.

Proc. Wash. Acad. Sci., II, p. 219, August 20, 1900.

101616. Skin and skull. Adult male. Santa Barbe Island, South China Sea. August 1, 1899. Collected by Dr. W. L. Abbott. Catalogued January 19, 1900.

Well-made skin in good condition; skull perfect, except right lower incisor broken off, first right upper premolar and last upper molar on left side missing.

Sciurus aberti mimus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XVII, p. 130, June 9, 1904.

70908. Skin and skull. Adult female. Hall Peak, Cimarron Mountains, New Mexico. January 16, 1895. Collected by C. M. Barber. Original number 61.

Well-made skin in good condition; skull perfect, except for absence of right upper premolars and end of left pterygoid.

Sciurus notatus miniatus Miller.

Proc. Wash. Acad. Sci., II, p. 79, July 25, 1900.

84415. Skin and skull. Adult female. Trong (or Tarang), lower Siam. February 25, 1897. Collected by Dr. W. L. Abbott. Catalogued March 25, 1898.

Well-made skin in good condition; skull perfect.

Sciurus negligens Nelson. Biological Survey collection.

Proc. Biol. Soc. Wash., XII, p. 147, June 3, 1898.

93028. Skin and skull. Adult female. Alta Mira, Tamaulipas, Mexico. April 18, 1898. Collected by E. A. Goldman. Original number 12319.

Well-made skin in good condition; skull with nasals and left jugal missing, and left mandibular ramus broken.

Sciurus nelsoni Merriam. **Biological Survey collection.**

Proc. Biol. Soc. Wash., VIII, p. 144, December 29, 1893.

51157. Skin and skull. Adult female. Huitzilac, Morelos, Mexico. January 1, 1893. Collected by E. W. Nelson. Original number 4144.

Well-made skin in good condition; skull perfect.

Sciurus albipes nemoralis Nelson. **Biological Survey collection.**

Proc. Biol. Soc. Wash., XII, p. 151, June 3, 1898.

=**Sciurus poliopus nemoralis** (Nelson). See Nelson, Proc. Wash. Acad. Sci., I, p. 50, May 9, 1899.

$\frac{35358}{47683}$. Skin and skull. Adult male. Patzcuaro, Michoacan, Mexico. July 23, 1892. Collected by E. W. Nelson and E. A. Goldman. Original number 2905.

Well-made skin in good condition; skull perfect.

Sciurus fremonti neomexicanus Allen. **Biological Survey collection.**

Bull. Amer. Mus. Nat. Hist., X, p. 291, July 22, 1898.

71690. Skin and skull. Adult male. Rayado Canyon, Colfax County, New Mexico. April 1, 1895. Collected by C. M. Barber. Original number 89.

Well-made skin in good condition; skull perfect.

Sciurus colliæi nuchalis Nelson. **Biological Survey collection.**

Proc. Wash. Acad. Sci., I, pp. 59–60, May 9, 1899.

$\frac{32657}{44580}$. Skin and skull. Adult male. Manzanillo, Colima, Mexico. February 2, 1892. Collected by E. W. Nelson. Original number 1828.

Well-made skin in good condition; skull perfect, except for absence of second left upper premolar; right audital bulla and pterygoids slightly broken.

Sciurus borneoensis palustris Lyon.

Proc. U. S. Nat. Mus., XXXIII, No. 1577, p. 553, December 24, 1907.

142330. Skin and skull. Adult male. North bank of the Kapuas River, below Pulo Limbang, western Borneo. September 22, 1905. Collected by Dr. W. L. Abbott. Original number 4467. Catalogued January 22, 1906.

Well-made skin in good condition; skull perfect, except slight injury to both angular processes of mandible.

Sciurus pannovianus Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 11, November 6, 1903.

112351. Skin and skull. Adult male. Pulo Pannow, Atas Islands, South China Sea. May 28, 1901. Collected by Dr. W. L. Abbott. Original number 952. Catalogued November 8, 1901.

Well-made skin in good condition; skull perfect, shot hole back of right supraorbital process.

Sciurus parvus Miller.

Proc. Biol. Soc. Wash., XIV, p. 33, April 5, 1901.

84509. Skin and skull. Adult male. Nulu, Sarawak, Borneo; altitude 1,000 feet. October, 1894. Collected by Charles Hose. Catalogued April 12, 1898.

Well-made skin in good condition; skull slightly broken about the foramen magnum, otherwise complete.

Sciurus pemangilensis Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 9, November 6, 1903.

112460. Skin and skull. Adult female. Pulo Pemangil, off coast of Johore. June 12, 1901. Collected by Dr. W. L. Abbott. Original number 1062. Catalogued November 13, 1901.

Well-made skin in good condition; skull perfect, except small holes in left bulla.

Sciurus peninsularis Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 10, November 6, 1903. See Lyon (Smithsonian Miscell. Coll., XLVIII, No. 1660, pp. 277–279, February 4, 1907), for remarks on the status of this species.

112511. Skin and skull. Adult male. North Bank of Endau River, Pahang, Malay Peninsula. June 21, 1901. Collected by Dr. W. L. Abbott. Original number 1078. Catalogued November 15, 1901.

Well-made skin in good condition; skull perfect.

Sciurus poliopus perigrinator Nelson. Biological Survey collection.

Proc. Biol. Soc. Wash., XVII, p. 149, October 6, 1904.

70279. Skin and skull. Adult female. Piaxtla, Puebla, Mexico. November 25, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 7104.

Well-made skin in good condition; skull perfect, except for slightly broken pterygoid and supraorbital border.

Sciurus hudsonicus petulans Osgood. Biological Survey collection.

North Amer. Fauna, No. 19, pp. 27–28, pl. 5, fig. 2, October 6, 1900.

97457. Skin and skull. Adult female. Glacier, White Pass, Alaska. June 4, 1899. Collected by W. H. Osgood. Original number 370.

Well-made skin in good condition; skull perfect.

Sciurus piniensis Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 14, November 6, 1903.

121800. Skin and skull. Adult female. Pulo Pinie, Batu Islands off west coast of Sumatra. March 1, 1903. Collected by Dr. W. L. Abbott. Original number 2344. Catalogued August 2, 1903.

Well-made skin in good condition; skull perfect, except loss of first and second upper molars on right side.

Sciurus pretiosus Miller.

Proc. U. S. Nat. Mus., XXVI, No. 1317, p. 454, February 3, 1903.

114325. Skin and skull. Adult female. Pulo Bangkaru, Banjak Islands, off west coast of Sumatra. January 20, 1902. Collected by Dr. W. L. Abbott. Original number 1442. Catalogued August 28, 1902.

Well-made skin in good condition; skull perfect.

Sciurus procerus Miller.

Proc. Wash. Acad. Sci., III, p. 122, March 26, 1901.

104698. Skin and skull. Adult male. Bunguran Island, Natuna Islands. July 18, 1900. Collected by Dr. W. L. Abbott. Original number 574. Catalogued December 17, 1900.

Well-made skin in good condition; skull perfect.

Sciurus proserpinæ Lyon.

Smithsonian Miscell. Coll., XLVIII, No. 1659, p. 275, February 4, 1907.

142285. Skin and skull. Adult female. Pulo Temaju (also written Temadjoe and Temadju), about 4 miles off the west coast of Borneo. June 9, 1905. Collected by Dr. W. L. Abbott. Original number 4180. Catalogued January 22, 1906.

Well-made skin in good condition; skull perfect except loss of left pm^1, pm^2, m^1, and left m_2, m_3.

Sciurus pumilus Miller.

Smithsonian Miscell. Coll., XLV, No, 1420, p. 15, November 6, 1903.

121627. Skin and skull. Adult male. South Pagi Island, off west coast of Sumatra. November 27, 1902. Collected by Dr. W. L. Abbott. Original number 2098. Catalogued July 31, 1903.

Well-made skin in good condition; skull perfect, except for a few scarcely noticeable shot holes.

Sciurus albipes quercinus Nelson. Biological Survey collection.

Proc. Biol. Soc. Wash., XII, pp. 150–151, June 3, 1898. Preoccupied by *Sciurus quercinus* Erxleben, Syst. Reg. Animal., p. 432, 1777. *Sciurus albipes hernandezi* Nelson, Science, new ser., VIII, p. 782, December 2, 1898.

=**Sciurus poliopus hernandezi** (Nelson). See Nelson, Proc. Wash. Acad. Sci., I, p. 48, May 9, 1899.

68202. Skin and skull. Adult female. Mountains on west side of valley of Oaxaca, Oaxaca, Mexico. September 15, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 6768.

Well-made skin in good condition; skull perfect, except for shot perforation from base of nasals through anterior part of palate.

Sciurus richmondi Nelson. Biological Survey collection.

Proc. Biol. Soc. Wash., XII, pp. 146–147, June 3, 1898.

$\frac{36481}{48851}$. Skin and skull. Adult female. Escondido River, 50 miles from Bluefields, Nicaragua. October 4, 1892. Collected by Dr. C. W. Richmond. Original number 118.

Well-made skin in good condition; skull perfect.

Sciurus rubeculus Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 22, November 6, 1903.

86777. Skin and skull. Adult male. Khow Sai Dow (1,000 feet), Trong (or Tarang), lower Siam. February 21, 1899. Collected by Dr. W. L. Abbott. Catalogued July 20, 1899.

Well-made skin in good condition; skull perfect, except pterygoids slightly injured.

Sciurus rubidiventris Miller.

Proc. Wash. Acad. Sci., III, p. 127, March 26, 1901.

104671. Skin and skull. Adult female. Bunguran Island, Natuna Islands. June 22, 1901. Collected by Dr. W. L. Abbott. Original number 498. Catalogued December 17, 1900.

Well-made skin in good condition; skull perfect, except condyloid process of right mandible shot away.

Sciurus rutiliventris Miller.

Proc. Wash. Acad. Sci., III, p. 126, March 26, 1901.

104658. Skin and skull. Adult male. Pulo Midei (Low Island), Natuna Islands. May 24, 1900. Collected by Dr. W. L. Abbott. Original number 405. Catalogued December 17, 1900.

Well-made skin in good condition; skull perfect, except several shot holes and angle of right half of mandible lacking.

Sciurus sanggaus Lyon.

Proc. U. S. Nat. Mus., XXXIII, No. 1577, p. 554, December 24, 1907.

142296. Skin and skull. Adult female. Sanggau, western Borneo, south bank of Kapuas River. August 21, 1905. Collected by Dr. W. L. Abbott. Original number 4357. Catalogued January 22, 1906.

Well-made skin in good condition; skull perfect.

Sciurus saturatus Miller.

Proc. U. S. Nat. Mus., XXVI, No. 1317, p. 453, February 3, 1903.

114629. Skin and skull. Adult female. Pulo Mansalar, off Tapanuli Bay, west coast of Sumatra. March 9, 1902. Collected by Dr. W. L. Abbott. Original number 1633. Catalogued September 3, 1902.

Well-made skin in good condition; skull perfect, except for loss of all the upper premolars, both last upper molars, right last lower molar.

Sciurus poliopus senex Nelson. Biological Survey collection.

Proc. Biol. Soc. Wash., XVII, pp. 148–149, October 6, 1904.

126208. Skin and skull. Adult female. La Salada, Michoacan, Mexico. March 14, 1903. Collected by E. W. Nelson and E. A. Goldman. Original number 16127.

Well-made skin in good condition; skull perfect, except for absence of first left upper premolar.

Sciurus seraiæ Miller.

Proc. Wash. Acad. Sci., III, p. 125, March 26, 1901.

104660. Skin and skull. Adult male. Pulo Seraia, Natuna Islands. May 29, 1900. Collected by Dr. W. L. Abbott. Original number 415. Catalogued December 17, 1900.

Well-made skin in good condition; skull perfect.

Sciurus serutus Miller.

Proc. U. S. Nat. Mus., XXXI, No. 1481, p. 58, July 23, 1906.

125025. Skin and skull. Adult male. Pulo Serutu, Karimata Islands, off west coast of Borneo. August 17, 1904. Collected by Dr. W. L. Abbott. Original number 3584. Catalogued December 7, 1904.

Well-made skin in good condition; skull perfect.

Sciurus suckleyi Baird.

Proc. Acad. Nat. Sci. Phila., VII, p. 333, this paper was reported favorably for publication April 24, 1855.

=**Sciurus douglasii** Bachman. See Baird, Mammals of North America, p. 275, 1857.

$\frac{272}{37008}$. Skin and skull. Adult male. Steilacoom, Washington. January 13, 1854. Collected by Dr. George Suckley, U. S. A., Pacific Railroad Survey. Original number 1. Skin catalogued March 17, 1854; skull, November 1, 1898.

Specimen made into a modern study skin and the skull removed in November, 1898. The skin is in fair condition, but the left fore leg is lacking. Only that part of the skull anterior to the brain-case, and the right half of the mandible is present.

In Baird's original description he gives the three measurements "Head and body 9 inches. Tail vertebræ 4¼ inches. To tip of hairs 6 inches." In 1857, in his Mammals of North America, Baird gives more details of the Pacific Railroad specimens, and in the table on page 278, No. 272, the above specimen is the only one which agrees with the above three measurements, and consequently it is taken as the type.

Sciurus sullivanus Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 17, November 6, 1903.

104377. Skin and skull. Adult female. Sullivan Island, Mergui Archipelago. February 1, 1900. Collected by Dr. W. L. Abbott. Original number 294. Catalogued November 6, 1900.

Well-made skin in good condition; skull perfect, except left pterygoid.

Sciurus tenuis surdus Miller.

Proc. Wash. Acad. Sci., II, p. 80, July 25, 1900.

84412. Skin and skull. Adult male. Trong (or Tarang), lower Siam. February 3, 1897. Collected by Dr. W. L. Abbott. Catalogued March 25, 1898.

Well-made skin in good condition; skull a trifle damaged by shot, the two premolars and first molar in the left upper jaw shot away. In left half of mandible only the two last molars remain, and in the right half the last molar has fallen out.

Type designated by number. In original description under "Measurements," external measurements of the type are said to be given. This is an error, however, as they are measurements of a paratype, No. 83243.

Sciurus vittatus tapanulius Lyon.

Smithsonian Miscell. Coll., XLVIII, No. 1660, p. 280, February 4, 1907.

114519. Skin and skull. Adult male. Tapanuli Bay, west coast of Sumatra. February 21, 1902. Collected by Dr. W. L. Abbott. Original number 1560. Catalogued September 2, 1902.

Well-made skin in good condition; skull perfect.

Sciurus vittatus tarussanus Lyon.

Smithsonian Miscell. Coll., XLVIII, No. 1660, p. 279, February 4, 1907.

141038. Skin and skull. Adult female. Tarussan Bay, west coast of Sumatra. December 28, 1904. Collected by Dr. W. L. Abbott. Original number 3857. Catalogued July 19, 1905.

Well-made skin in good condition; skull perfect, except loss of left pm^1 and shot injuries to angular processes of mandible.

Sciurus tedongus Lyon.

Proc. U. S. Nat. Mus., XXXI, No. 1498, p. 591, December 18, 1906.

124717. Skin and skull. Adult male. Tanjong Tedong, island of Banka, east of Sumatra. June 1, 1904. Collected by Dr. W. L. Abbott. Original number 3285. Catalogued November 30, 1904.

Well-made skin in good condition; skull nearly perfect, a few shot holes, right half of mandible especially damaged.

Sciurus tenuirostris Miller.

Proc. Wash. Acad. Sci., II, p. 221, fig. 13c, August 20, 1900.

101753. Skin and skull. Adult female. Pulo Tioman, off southeast coast Malay Peninsula. September 30, 1899. Collected by Dr. W. L. Abbott. Catalogued January 20, 1900.

Well-made skin in good condition; skull with several shot holes, and the last two upper molars on each side shot away; posterior portion of right half of mandible lacking, and the first two right mandibular cheek-teeth shot away.

Sciurus thomasi Nelson.

Proc. Wash. Acad. Sci., I, p. 71, pl. 2, fig. 6, May 9, 1899.

$\frac{12044}{23567}$. Skin and skull. Talamanca, Costa Rica. 1874. Collected by Prof. W. M. Gabb. Skin catalogued November 11, 1874; skull, April 16, 1889.

The specimen has been remade into a modern study skin and is in good condition; skull is perfect except for loss of pterygoids and of right postorbital process.

Sciurus oculatus tolucæ Nelson. Biological Survey collection.

Proc. Biol. Soc. Wash., XII, pp. 148–149, June 3, 1898.

55927. Skin and skull. Adult male. North slope Volcan Toluca, Mexico, Mexico. September 8, 1893. Collected by E. W. Nelson and E. A. Goldman. Original number 5419.

Well-made skin in good condition; skull perfect, except for fractured squamosal and supraoccipital region.

Sciurus truei Nelson. Biological Survey collection.

Proc. Wash. Acad. Sci., I, pp. 61–62, May 9, 1899.

96229. Skin and skull. Adult male. Camoa, Rio Mayo, Sonora, Mexico. January 20, 1899. Collected by E. A. Goldman. Original number 13405.

Well-made skin in good condition; skull perfect, except for fractured frontal and supraoccipital and absence of last left upper and lower molars.

Sciurus ubericolor Miller.

Proc. U. S. Nat. Mus., XXVI, No. 1317, p. 455, February 3, 1903.

114373. Skin and skull. Adult female. Pulo Tuangku, Banjak Islands, off west coast of Sumatra. February 5, 1902. Collected by Dr. W. L. Abbott. Original number 1517. Catalogued August 28, 1902.

Well-made skin in good condition; skull in good condition, except most of left zygoma and anterior half of left ramus of mandible shot away.

Sciurus undulatus True.

Proc. U. S. Nat. Mus., XV, No. 915, p. 465, fig. 3, October 26, 1892.

$\frac{19005}{34731}$. Skin and skull. Adult male. Mount Kilimanjaro (6,000 feet), German East Africa. June 12, 1888. Collected by Dr. W. L. Abbott. Original number 7. Catalogued June 24, 1890.

Well-made skin in good condition; skull perfect.

Type designated by number, skull No. 34731 being figured and marked "type." Two specimens are listed, the above and a female, No. 19006, also marked "type," but as there can not be two types of the same species, it seems advisable to consider the second specimen as a paratype, the one figured as the type.

Sciurus hudsonicus ventorum Allen. Biological Survey collection.

Bull. Amer. Mus. Nat. Hist., X, pp. 263–264, July 22, 1898.

56030. Skin and skull. Adult male (not female, as in original description). South Pass City, Wyoming. September 6, 1893. Collected by V. Bailey. Original number 4305.

Well-made skin in good condition; skull perfect, except for numerous small shot perforations and absence of one molar.

Sciurus deppei vivax Nelson. Biological Survey collection.

Proc. Biol. Soc. Wash., XIV, pp. 131–132, August 9, 1901.

107932. Skin and skull. Adult female. Apazote, Campeche, Mexico. January 8, 1901. Collected by E. A. Goldman. Original number 14429.

Well-made skin in good condition; skull perfect.

Sciurus carolinensis yucatanensis Allen. Cotype.

Monographs North American Rodentia, p. 705, August, 1877.

=**Sciurus yucatanensis** (Allen). See Elliot, Field Columbian Mus., Zool. Ser., I, p. 80, May, 1896.

$\frac{8503}{37496}$. Skin and skull. Adult female. Merida, Yucatan, Mexico. March 3, 1865. Collected by Dr. A. Schott, "Comision cientifica de Yucatan, Jose Salagar Llarregui." Original number 229. Skin catalogued May 2, 1866; skull, September 20, 1898.

The specimen has been remade into a modern study skin and is in good condition; skull in fair condition, right zygoma lacking, and a considerable hole above the foramen magnum as well as breaks about the optic foramina.

In the original description Dr. J. A. Allen speaks of four specimens, all of the same date, locality, and collector as the above. In the table of measurements, on page 711, three of them are referred to by number, namely, 8502, 8503, and 8505, which should be regarded as cotypes. Unfortunately, Nos. 8502 and 8505 can not be found. His fourth specimen, not referred to by number and hence regarded as a paratype, is in good condition and in the collection. It is about half or two-thirds grown.

Genus FUNAMBULUS.

Funambulus castaneus Miller.

Proc. Wash. Acad. Sci., II, p. 217, August 20, 1900.

101696. Skin and skull. Immature male. Pulo Siantan, Anamba Islands, South China Sea. September 10, 1899. Collected by Dr. W. L. Abbott. Catalogued January 19, 1900.

Fairly well-made skin in good condition; skull perfect.

Funambulus obscurus Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 23, November 6, 1903.

121640. Skin and skull. Adult female. South Pagi Island, off west coast of Sumatra. November 22, 1902. Collected by Dr. W. L. Abbott. Original number 2086. Catalogued July 31, 1903.

Well-made skin in good condition; skull perfect.

Funambulus peninsulæ Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 25, November 6, 1903.

86776. Skin and skull. Adult male. Khow Sai Dow, Trong (or Tarang), lower Siam. February 18, 1899. Collected by Dr. W. L. Abbott. Catalogued July 20, 1899.

Well-made skin in good condition; skull perfect.

Funambulus rostratus Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 24, November 6, 1903.

121801. Skin and skull. Adult female. Tana Bala, Batu Islands, off west coast of Sumatra. February 12, 1903. Collected by Dr. W. L. Abbott. Original number 2281. Catalogued August 2, 1903.

Well-made skin in good condition, tail apparently imperfect in life; skull perfect.

Genus RATUFA.

Ratufa anambæ Miller.

Proc. Wash. Acad. Sci., II, p. 215, August 20, 1900.

101725. Skin and skull. Adult female (not male, as in original description). Pulo Jimaja, Anamba Islands, South China Sea. September 25, 1899. Collected by Dr. W. L. Abbott. Catalogued January 20, 1902.

Well-made skin in good condition ; skull perfect.

Ratufa angusticeps Miller.

Proc. Wash. Acad. Sci., III, p. 130, March 26, 1901.

104646. Skin and skull. Adult male. Pulo Lingung, off south coast of Bunguran, Natuna Islands. June 17, 1900. Collected by Dr. W. L. Abbott. Original number 481. Catalogued December 17, 1900.

Well-made skin in good condition; skull perfect, except for left malar shot away.

Ratufa arusinus Lyon.

Proc. U. S. Nat. Mus., XXXII, No. 1534, p. 442, May 23, 1907.

143351. Skin and skull. Adult male. Aru Bay, northeastern coast of Sumatra. January 16, 1906. Collected by Dr. W. L. Abbott. Original number 4635. Catalogued June 21, 1906.

Well-made skin in good condition; skull perfect.

Ratufa balæ Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 6, November 6, 1903.

121715. Skin and skull. Adult male. Tana Bala, Batu Islands, off west coast of Sumatra. February 5, 1903. Collected by Dr. W. L. Abbott. Original number 2224. Catalogued August 1, 1903.

Well-made skin in good condition; skull perfect.

Ratufa polia bancana Lyon.

Proc. U. S. Nat. Mus., XXXI, No. 1498, p. 587, December 18, 1906.

124680. Skin and skull. Adult male. Tanjong Rengsam, island of Banka, east of Sumatra. May 27, 1904. Collected by Dr. W. L. Abbott. Original number 3277. Catalogued November 29, 1904.

Well-made skin in good condition; skull nearly perfect, somewhat damaged by shot, especially mandible.

Ratufa carimonensis Miller.

Proc. U. S. Nat. Mus., XXXI, No. 1485, p. 257, September 11, 1906.

122813. Skin and skull. Adult female. Great Karimon Island, Rhio-Linga Archipelago. June 2, 1903. Collected by Dr. W. L. Abbott. Original number 2465. Catalogued January 20, 1904.

Well-made skin in good condition; skull perfect.

Ratufa catemana Lyon.

Proc. U. S. Nat. Mus., XXXII, No. 1534, p. 443, May 23, 1907.

123124. Skin and skull. Adult male. Kateman River, southeastern Sumatra. August 27, 1903. Collected by Dr. W. L. Abbott. Original number 2759. Catalogued January 25, 1904.

Well-made skin in good condition; skull somewhat damaged by shot holes in palate and cranium; left zygoma and anterior portion of right half of mandible lacking.

Ratufa condurensis Miller.

Proc. U. S. Nat. Mus., XXXI, No. 1485, p. 258, September 11, 1906.

122879. Skin and skull. Adult male. Pulo Kundur, Rhio-Linga Archipelago. June 25, 1903. Collected by Dr. W. L. Abbott. Original number 2552. Catalogued January 21, 1904.

Well-made skin in good condition; skull perfect, except loss of right pterygoid; left m^1 and pm^1 worn down to alveoli and right m_2 lost.

Ratufa confinis Miller.

Proc. U. S. Nat. Mus., XXXI, No. 1485, p. 259, September 11, 1906.

113134. Skin and skull. Adult female. Sinkep Island, Rhio-Linga Archipelago. September 3, 1901. Collected by Dr. W. L. Abbott. Original number 1265. Catalogued January 31, 1902.

Well-made skin in good condition; skull perfect, except loss of left pterygoid.

Ratufa conspicua Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 5, November 6, 1903.

115528. Skin and skull. Adult male. Pulo Bintang, Rhio-Linga Archipelago. August 19, 1902. Collected by Dr. W. L. Abbott. Original number 1900. Catalogued December 27, 1902.

Well-made skin in good condition; skull perfect.

Ratufa femoralis Miller.

Proc. U. S. Nat. Mus., XXVI, No. 1317, p. 447, February 3, 1903.

114361. Skin and skull. Adult female. Pulo Tuangku, Banjak Islands, off west coast of Sumatra. January 27, 1902. Collected by Dr. W. L. Abbott. Original number 1479. Catalogued August 28, 1902.

Well-made skin in good condition; skull perfect.

Ratufa insignis Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 4, November 6, 1903.

115531. Skin and skull. Adult male. Pulo Sugi, Rhio-Linga Archipelago. August 26, 1902. Collected by Dr. W. L. Abbott. Original number 1960. Catalogued December 27, 1902.

Well-made skin in good condition; skull perfect, except that the left pterygoid is broken.

Ratufa lænata Miller.

Proc. U. S. Nat. Mus., XXVI, No. 1317, p. 449, pl. 19, February 3, 1903.

114350. Skin and skull. Adult male. Pulo Tuangku, Banjak Islands, off west coast of Sumatra. January 27, 1902. Collected by Dr. W. L. Abobtt. Original number 1478. Catalogued August 28, 1903.

Well-made skin in good condition; skull perfect.

Ratufa masæ Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 7, November 6, 1903.

121818. Skin and skull. Adult male. Tana Masa, Batu Islands, off west coast of Sumatra. February 21, 1903. Collected by Dr. W. L. Abbott. Original number 2330. Catalogued August 3, 1903.

Well-made skin in good condition; skull perfect, except for a few scattered shot holes.

Ratufa melanopepla Miller.

Proc. Wash. Acad. Sci., II, p. 71, July 25, 1900.

83230. Skin and skull. Adult male. Trong (or Tarang), lower Siam. February 27, 1896. Collected by Dr. W. L. Abbott. Catalogued December 1, 1896.

Well-made skin in good condition; skull perfect, except for loss of left last upper molar and right pterygoid.

Ratufa nigrescens Miller.

Proc. U. S. Nat. Mus., XXVI, No. 1317, p. 448, February 3, 1903.

114556. Skin and skull. Adult female. Pulo Mansalar, off Tapanuli Bay, west coast of Sumatra. March 11, 1902. Collected by Dr. W. L. Abbott. Original number 1641. Catalogued September 2, 1902.

Well-made skin in good condition; skull perfect.

Ratufa notabilis Miller.

Proc. Acad. Nat. Sci. Phila., 1902, p. 150, June 11, 1902.

113064. Skin and skull. Adult male. West coast of Linga Island, Rhio-Linga Archipelago, August 24, 1901. Collected by Dr. W. L. Abbott. Original number 1210. Catalogued January 28, 1902.

Well-made skin in good condition; skull perfect.

Ratufa palliata Miller.

Proc. Acad. Nat. Sci. Phila., 1902, p. 147, June 11, 1902.

113162. Skin and skull. Adult male. Indragiri River, eastern Sumatra. September 23, 1901. Collected by Dr. W. L. Abbott. Original number 1327. Catalogued February 4, 1902.

Well-made skin in good condition; skull slightly injured by shot, both upper incisors more or less broken, and a piece out of right zygoma.

Ratufa piniensis Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 8, November 6, 1903.

121940. Skin and skull. Adult male. Pulo Pinie, Batu Islands, off west coast of Sumatra. March 1, 1903. Collected by Dr. W. L. Abbott. Original number 2343. Catalogued August 2, 1903.

Well-made skin in good condition (tail imperfect in life); skull slightly damaged by shot; both lower incisors broken off to alveloi, hole in right bulla, and slight damage about lachrymal region on each side.

Ratufa polia Lyon.

Proc. U. S. Nat. Mus., XXXI, No. 1498, p. 585, December 18, 1906.

125004. Skin and skull. Adult female. Bukit Menguru, Billiton Island, between Sumatra and Borneo. August 9, 1904. Collected by Dr. W. L. Abbott. Original number 3551. Catalogued December 4, 1904.

Well-made skin in good condition; skull perfect.

Ratufa pyrsonota Miller.

Proc. Wash. Acad. Sci., II, p. 75, July 25, 1900.

83483. Skin and skull. Adult male. Trong (or Tarang), lower Siam. September 29, 1896. Collected by Dr. W. L. Abbott. Catalogued April 23, 1897.

Well-made skin in good condition; skull perfect.

Ratufa tiomanensis Miller.

Proc. Wash. Acad. Sci., II, p. 216, August 20, 1900.

101751. Skin and skull. Adult male. Pulo Tioman, off southeast coast of Malay Peninsula. October 4, 1899. Collected by Dr. W. L. Abbott. Catalogued January 20, 1900.

Well-made skin in good condition; skull perfect.

Genus PETAURISTA.

Petaurista batuana Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 27, November 6, 1903.

121742. Skin and skull. Adult male. Tana Bala, Batu Islands, off west coast of Sumatra. February 5, 1903. Collected by Dr. W. L. Abbott. Original number 2233. Catalogued August 1, 1903.

Well-made skin in good condition; skull perfect, except for shot holes about left antorbital foramen.

Petaurista terutaus Lyon.

Proc. Biol. Soc. Wash., XX, p. 17, February 23, 1907.

123934. Skin and skull. Adult male. Pulo Terutau (also written Trotau, Trotto), about 15 geographical miles off west coast Malay Peninsula, and about 5½° north of equator. April 9, 1904. Collected by Dr. W. L. Abbott. Original number 3219. Catalogued July 22, 1904.

Well-made skin in good condition; skull perfect.

Genus SCIUROPTERUS.

Sciuropterus amœnus Miller.

Proc. U. S. Nat. Mus., XXXI, No. 1485, p. 261, September 11, 1906.

122883. Skin and skull. Adult male. Pulo Kundur, Rhio-Linga Archipelago. June 12, 1903. Collected by Dr. W. L. Abbott. Original number 2483. Catalogued January 21, 1904.

Well-made skin in good condition; skull perfect.

Sciuropterus volans goldmani Nelson. Biological Survey collection.

Proc. Biol. Soc. Wash., XVII, p. 148, October 6, 1904.

132833. Skin and skull. Adult male. Twenty miles southeast of Teopisca, Chiapas, Mexico. April 8, 1904. Collected by E. A. Goldman. Original number 16667.

Well-made skin in good condition; skull lacking right audital bulla, left upper molars, and posterior part of palate; left mandibular ramus in three pieces.

Sciuropterus alpinus klamathensis Merriam. Biol. Survey coll.

Proc. Biol. Soc. Wash., XI, p. 225, July 15, 1897.

87310. Skin and skull. Adult female. Fort Klamath, Oregon. January 11, 1897. Collected by B. L. Cunningham. Original number 355x.

Well-made skin in good condition; skull perfect.

Sciuropterus sabrinus macrotis Mearns.

Proc. U. S. Nat. Mus., XXI, No. 1147, p. 353, figs. 1, 2, and 3, November 4, 1898.

83152. Skin and skull. Adult female. Hunter Mountain, Catskill Mountains, Green County, New York. August 31, 1896. Col-

lected by Dr. E. A. Mearns, U. S. A. Original number 4036. Catalogued November 16, 1896.

Well-made skin in good condition; skull perfect.

Sciuropterus mærens Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 26, pl. 1, fig. 1, November 6, 1903.

121531. Skin and skull. Adult female. North Pagi Island, off west coast of Sumatra. January 14, 1902. Collected by Dr. W. L. Abbott. Original number 2206. Catalogued July 29, 1903.

Well-made skin in good condition; skull perfect.

Sciuropterus oregonensis stephensi Merriam. Biol. Survey coll.

Proc. Biol. Soc. Wash., XIII, p. 151, June 13, 1900.

99830. Skin and skull. Young adult female. Sherwood, Mendocino County, California. May 10, 1894. Collected by F. Stephens. Original number 2307 (2624x).

Well-made skin in good condition; skull perfect, except for absence of right postorbital process and right coronoid process.

Sciuropterus yukonensis Osgood.

North Amer. Fauna, No. 19, p. 25, October 6, 1900.

$\frac{18802}{35320}$. Skin and skull. Adult female. Camp Davidson, Yukon River, near Alaska-Canada boundary. December 8, 1890. Collected by R. E. Carson, a member of the survey party of the United States Coast and Geodetic Survey. Catalogued March 10, 1892.

Well-made skin in good condition; skull not quite perfect, some slight damage about the bony palate.

Sciuropterus alpinus zaphæus Osgood. Biological Survey collection.

Proc. Biol. Soc. Wash., XVIII, pp. 133–134, April 18, 1905.

136137. Skin and skull. Adult female. Helm Bay, Cleveland Peninsula, Alaska. January 21, 1905. Collected by C. Catt. Original number 5196x.

Well-made skin in good condition; skull perfect.

Family ANOMALURIDÆ.

Genus IDIURUS.

Idiurus macrotis Miller.

Proc. Biol. Soc. Wash., XII, p. 73, figs. 15–19, March 24, 1898.

83625. Skin and skull. Young adult male. Efulen, Cameroon district, West Africa. June 18, 1895. Collected by G. L. Bates. Original number 4. Catalogued June 23, 1897.

Well-made skin in good condition; skull in fair condition, the four occipital bones cut away.

Order FERÆ.

Family PHOCIDÆ.

Genus PHOCA.

Halichœrus antarcticus Peale.

U. S. Exploring Exped., VIII, Mamm. and Ornithol., p. 30; woodcut, p. 31, 1848.

Phoca pealii Gill, Communications, Essex Institute, V, 1866–7, p. 4, footnote. Allen, Monogr. North Amer. Pinnipeds, U. S. Geol. Surv., Miscell. Pub., XII, 1880, p. 561; and pp. 580–582.

=Phoca richardii (Gray). See Allen, Bull. Amer. Mus. Nat. Hist., XVI, pp. 491–492; see also p. 463 and pp. 466 and 467, December 12, 1902.

3648. Skull. Young adult. Said to have been collected by the United States Exploring Expedition at Deception Island, October 10. Catalogued January 10, 1860. Gill and Allen (see references above) strongly and rightly question the locality given by Peale.

The skull has evidently been injured in recent years. Most of the right half of the brain case has been broken away, including the right zygoma. The tips of the nasals are injured and the region about the right premaxillo-maxillo-nasal sutures considerably broken. There should be a skin, No. 3741, which can not be found.

Type not designated by number, but a consideration of Allen's "Pinnipeds," pp. 580–582, leaves no doubt that this specimen is the type.

Phoca richardii geronimensis Allen. Biological Survey collection.

Bull. Amer. Mus. Nat. Hist., XVI, pp. 495–496, December 12, 1902.

81520. Skin and skull (skin not examined by describer and not mentioned in original description). Adult male. San Geronimo Island, Lower California, Mexico. September 13, 1896. Collected by A. W. Anthony. Original number 209.

Well-made skin in good condition; skull perfect, except for perforation of basioccipital.

Phoca ochotensis macrodens Allen.

Bull. Amer. Mus. Nat. Hist., XVI, p. 483, December 12, 1902.

83447. Skull (no skin). Young adult (male *fide* Allen). Avatcha Bay, Kamchatka. 1896. Collected by Dr. L. Stejneger. Catalogued April 7, 1897.

Skull nearly perfect, except right malar and first right lower incisor lost. Atlas present.

Phoca richardii pribilofensis Allen.

Bull. Amer. Mus. Nat. Hist., XVI, p. 495, December 12, 1902.

$\frac{83223}{49550}$. Skin and skeleton. Adult female. St. Paul Island, Pribilof Islands, Alaska. Collected by C. H. Townsend, U. S. Bureau of Fisheries. Catalogued November 28, 1896.

Well-made skin in good condition; skull perfect (in Division of Mammals); rest of skeleton in storage (Division of Comparative Anatomy).

In the original description, owing to the confusion caused by the double entry of one specimen in two different divisions of the Museum, Dr. J. A. Allen does not seem to have been aware that this skin, 83223, is the same individual as skull and skeleton 49550.

Phoca stejnegeri Allen.

Bull. Amer. Mus. Nat. Hist., XVI, p. 485, figs. 7, 8, and 10, December 12, 1902.

21310. Skull only. Adult male. Bering Island. April 16, 1883. Collected by Dr. L. Stejneger. Original number 1973. Catalogued July 17, 1884.

Skull perfect, except for loss of two of the lower incisors.

Genus MIROUNGA.

Macrorhinus angustirostris Gill.

Communication Essex Institute, V, 1866–7, p. 13. Communicated October 16, 1865. Preliminary notice only.

Proc. Chicago Acad. Sci., I, p. 33, April, 1866.

=Mirounga angustirostris (Gill). See Elliot, Land and Sea Mammals Middle America and West Indies, Field Columbian Mus., Zool. Ser., IV, p. 245, 1904.

4704. Skull. Immature female. St. Bartholomew Bay, Lower California, Mexico. 1857. Collected by Dr. W. O. Ayres. Catalogued October 18, 1863. Skull has the following legend on it in old, nearly faded writing: "Macrorhinus | * * * Barthole mew Bay | L. California | Sea Elephant | * * posited Dr. Ayre | A | " and number 4704.

Skull perfect except loss of the five right maxillary teeth, last three left maxillary teeth, inner upper right incisor, right lower canine, and three mandibular cheek teeth, left lower inner incisor and last mandibular cheek tooth.

Type not designated by number. There is but one specimen in the Museum answering to the locality and dimensions published by Dr. T. N. Gill, and that is the above, No. 4704. The type skull is figured by Allen (Hist. North Amer. Pinnipeds, 1880, figs. 57, 58, 59, 60, on pp. 744 to 747). Some of the teeth were lacking at that date. On page 748, footnote to table, No. 4704 is said to be the type of the species.

Family OTARIIDÆ.

Genus ARCTOCEPHALUS.

Arctocephalus townsendi Merriam.

Proc. Biol. Soc. Wash., XI, p. 178, July 1, 1897.

83617. Skull. Adult male. Picked up on the beach on the west side of Guadelupe Island, Lower California. May 22, 1892. Collected by C. H. Townsend. Catalogued June 15, 1897.

Skull is an old weatherworn specimen, without teeth and with no lower jaw. On the whole, it is in good condition for such a specimen. The only serious damage to the skull is a large hole in the brain case, superoposteriorly.

Family FELIDÆ

Genus LYNX.

Lynx ruffus californicus Mearns.

Preliminary Diagnoses of New Mammals of the Genera Lynx, Urocyon, Spilogale, and Mephitis, from the Mexican Boundary Line, p. 2, January 12, 1897. (Reprinted in Proc. U. S. Nat. Mus., XX, No. 1126, p. 458, December 24, 1897.)

$\frac{1588}{37163}$. Skin and skull. Adult female. San Diego, California. February 2, 1856. Collected by Dr. J. F. Hammond. Skin catalogued February 27, 1856; skull, August 8, 1896.

Well-made skin in fair condition, a small bare spot on throat. It was evidently made over into its present shape and the skull removed and cleaned in 1896. Skull perfect.

Lynx ruffus eremicus Mearns.

Preliminary Diagnoses of New Mammals of the Genera Lynx, Urocyon, Spilogale, and Mephitis from the Mexican Boundary Line, p. 1, January 12, 1897. (Reprinted in Proc. U. S. Nat. Mus., XX, No. 1126, p. 457, December 24, 1897.)

60676. Skin, skull, and tail vertebræ. Adult male. New River, 6 miles northwest of Laguna station, in the Colorado Desert, San Diego County, California. May 5, 1894. Collected by Dr. E. A. Mearns, U. S. A. Original number 3506. International Boundary Commission. Catalogued November 5, 1894.

Specimen remade in February, 1902, into a modern study skin, in good condition; skull perfect.

Lynx fasciatus pallescens Merriam. Biological Survey collection.

North Amer. Fauna, No. 16, p. 104, October 28, 1899.

76585. Skin and skull. Adult male. South base of Mount Adams, near Trout Lake, Washington. January 10, 1896 (not 1895, as in original description). Collected by D. N. Kaegi. Original number 23.

Well-made skin in good condition; skull perfect, except for broken left pterygoid.

Lynx uinta Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, pp. 71–72, March 22, 1902.

$\frac{18915}{25648}$. Skin and skull. Adult male. Bridger Pass, south slope Uinta Mountains, Wyoming. May 11, 1890. Collected by V. Bailey. Original number 1156.

Well-made skin in good condition; skull perfect.

Genus FELIS.

Felis æquatorialis Mearns.

Proc. U. S. Nat. Mus., XXV, No. 1286, p. 246, September 17, 1902.

113267. Skin and skull. Adult female. Paramba, northern Ecuador (altitude 3,500 feet). November 2, 1899. Collected by G. Flemming. Original number 22. Catalogued February 25, 1902.

Well-made skin in good condition; skull perfect, except that the zygomatic arches have been broken, but are now repaired; right pterygoid lost.

Felis apache Mearns.

Proc. Biol. Soc. Wash., XIV, p. 150, August 9, 1901.

1373. Skull only. Young adult female. Matamoras, Tamaulipas, Mexico. Collected by Dr. J. L. Berlandier. Catalogued January 25, 1855.

Three teeth are missing, both last upper molars and the first left upper premolar; otherwise skull perfect.

Felis hippolestes aztecus Merriam. Biological Survey collection.

Proc. Wash. Acad. Sci., III, pp. 592–593, December 11, 1901.

99658. Skin and skull. Adult male. Colonia Garcia, Chihuahua, Mexico. October 17, 1899. Collected by H. A. Cluff. Original number 2401x.

Well-made skin in good condition; skull perfect.

Felis aztecus browni Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XVI, pp. 73–74, May 29, 1903.

=**Felis hippolestes browni** (Merriam).

125719. Skull only. Adult male. Lower Colorado River, 12 miles south of Yuma, Arizona. February (?), 1903. Collected by Herbert Brown. Original number 3908x.

Skull with repaired fractures of left mandible, left zygoma, and inner wall of orbit; left audital bulla broken; left pterygoid and left coronoid absent; two upper incisors, left canine, left carnassial, and last left molar badly broken.

Felis cacomitli Berlandier in Baird.

Report U. S. and Mexican Boundary Survey, II, Pt. 2, p. 12, January, 1859.

1426. Skull only. Adult female. Matamoras, Tamaulipas, Mexico. 1840. Collected by Dr. J. L. Berlandier. Received from Lieut. D. N. Couch, U. S. A. Catalogued January 27, 1855.

Skull nearly perfect; lambdoid crest worn by handling, etc., and left bulla broken.

Felis centralis Mearns.

Proc. Biol. Soc. Wash., XIV, p. 139, August 9, 1901.

14177. Skull. Adult, probably male. Talamanca, Costa Rica. Collected by Prof. W. M. Gabb. Original number 47. Catalogued November 19, 1874.

Skull perfect. Catalogue calls for a skin, No. 12177, which can not be found.

Felis costaricensis Mearns.

Proc. U. S. Nat. Mus. XXV, No. 1286, p. 245, September 17, 1902. **Preoccupied** by *Felis bangsi costaricensis* Merriam, Proc. Wash. Acad. Sci., III, p. 596, December 11, 1901.

=**Felis pardalis mearnsi** Allen. Bull. Amer. Mus. Nat. Hist., XX, 1904, p. 71, February 29, 1904.

14180. Skull. Adult (male, *fide* Dr. E. A. Mearns). Talamanca, Costa Rica. Collected by Prof. W. M. Gabb. Original number 73. Catalogued November 19, 1874.

The catalogue calls for a skin, 12180, but it has never been found, and the type was described without it. Skull is nearly perfect; the pterygoids are chipped and the following teeth are missing from the upper jaw: Right side, first incisor, first premolar, and the molar; left side, first incisor, canine, and first premolar.

Felis fossata Mearns.

Proc. Biol. Soc. Wash., XIV, p. 150, August 9, 1901.

7036. Skull only. Adult. Merida, Yucatan, Mexico. Collected by Dr. A. Schott. Original number 952. Catalogued July 8, 1866.

Skull perfect.

Felis hernandesii goldmani Mearns.

Proc. Biol. Soc. Wash., XIV, p. 142, August 9, 1901.

105930. Skin only. Adult. Yohaltun, Campeche, Mexico. January 5, 1901. Received from E. A. Goldman. Catalogued June 18, 1901.

The skin is a tanned pelt, without feet, in good condition.

Felis hippolestes Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XI, p. 219, July 15, 1897.

57936. Skin and skull. Old male. Wind River Mountains, near head of Big Wind River, Wyoming. November, 1892. Collected by John Burlingame.

Well-made skin in good condition; skull perfect, except for broken auditul bullæ and right pterygoid.

Felis limitis Mearns. Biological Survey collection.

Proc. Biol. Soc. Wash., XIV, pp. 146–148, August 9, 1901.

=**Felis pardalis albescens** Pucheran. See Allen, Bull. Amer. Mus. Nat. Hist., XXII, pp. 219–221, July 25, 1906.

$\frac{32679}{44602}$. Skin and skull. Adult male. Brownsville, Texas. March 4, 1892. Collected by F. B. Armstrong. Original number 102.

Well-made skin in good condition; skull perfect.

Felis hippolestes olympus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XI, p. 220, July 15, 1897.

77973. Skin and skull. Adult male (?). Lake Cushman, Olympic Mountains, Washington. April 18, 1896. Collected by T. Hayes.

Well-made skin in good condition; skull perfect.

Felis puma patagonica Merriam. Biological Survey collection.

Proc. Wash. Acad. Sci., III, pp. 598–600, December 11, 1901.

108693. Skin and skull. Young adult male. East base Andes Mountains (lat. 47° 30′), Patagonia. 1899. Collected by J. B. Hatcher. Original number 3020x.

Tanned skin in good condition, claws missing; skull perfect, except for absence of one lower incisor.

Family VIVERRIDÆ.

Genus ARCTOGALIDIA.

Arctogalidia fusca Miller.

Proc. U. S. Nat. Mus., XXXI, No. 1485, p. 269, September 11, 1906.

122920. Skin and skull. Adult male. Pulo Kundur, Rhio-Linga Archipelago. June 22, 1903. Collected by Dr. W. L. Abbott. Original number 2540. Catalogued January 22, 1904.

Well-made skin in good condition; skull perfect.

Arctogalidia inornata Miller.

Proc. Wash. Acad. Sci., III, p. 131, March 26, 1901.

104859. Skin and skull. Old adult male. Bunguran Island, Natuna Islands. June 23, 1900. Collected by Dr. W. L. Abbott. Original number 502. Catalogued December 20, 1900.

Well-made skin in good condition. Skull perfect, very old; teeth much worn and many of them lost, due to age.

Arctogalidia major Miller.

Proc. Biol. Soc. Wash., XIX, p. 25, February 26, 1906.

83510. Skin and skull. Young (permanent dentition in place, but unworn; sutures of rostrum and brain case plainly visible) adult male. Trong (or Tarang), lower Siam. September 3, 1896. Collected by Dr. W. L. Abbott. Catalogued April 28, 1897.

Well-made skin in good condition; skull perfect.

Arctogalidia minor Lyon.

Proc. U. S. Nat. Mus., XXXI, No. 1498, p. 599, December 18, 1906.

124984. Skin and skull. Adult female. Buding Bay, Billiton Island, between Sumatra and Borneo. August 3, 1904. Collected by Dr. W. L. Abbott. Original number 3532. Catalogued December 6, 1904.

Well-made skin in good condition; skull perfect, except for shot hole in right half of cranium and loss of right m^2.

Arctogalidia simplex Miller.

Proc. Acad. Nat. Sci. Phila., 1902, p. 156, June 11, 1902.

113069. Skin and skull. Adult male. Linga Island, Rhio-Linga Archipelogo. August 30, 1901. Collected by Dr. W. L. Abbott. Original number 1254. Catalogued January 28, 1902.

Well-made skin in good condition; skull perfect.

Genus PARADOXURUS.

Paradoxurus brunneipes Miller.

Proc. U. S. Nat. Mus., XXXI, No. 1485, p. 269, September 11, 1906.

122886. Skin and skull. Adult male. Pulo Kundur, Rhio-Linga Archipelago. June 24, 1903. Collected by Dr. W. L. Abbott. Original number 2549. Catalogued January 21, 1904.

Well-made skin in good condition; skull perfect.

Paradoxurus canescens Lyon.

Proc. U. S. Nat. Mus., XXXI, No. 1498, p. 597, December 18, 1906.

124943. Skin and skull. Adult male. Tanjong Batu, Billiton Island, between Sumatra and Borneo. July 19, 1904. Collected by Dr. W. L. Abbott. Original number 3520. Catalogued December 6, 1904.

Well-made skin in good condition; skull perfect.

Paradoxurus lignicolor Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 44, pl. 4, fig. 1; pl. 5, fig. 1, November 6, 1903.

121645. Skin and skull. Adult male. North Pagi Island, off west coast of Sumatra. November 19, 1902. Collected by Dr. W. L. Abbott. Original number 2068. Catalogued July 31, 1903.

Well-made skin in good condition; skull perfect.

Paradoxurus robustus Miller.

Proc. Biol. Soc. Wash., XIX, p. 26, February 26, 1906.

86796. Skin and skull. Adult female. Khow Sai Dow (2,000 feet), Trong (or Tarang), lower Siam. February 13, 1899. Collected by Dr. W. L. Abbott. Catalogued July 20, 1899.

Well-made skin in good condition; skull perfect.

Genus HEMIGALE.

Hemigale minor Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 43, pl. 3, fig. 2, November 6, 1903.

121651. Skin and skull. Adult female. South Pagi Island, off west coast of Sumatra. December 27, 1902. Collected by Dr. W. L. Abbott. Original number 2173. Catalogued July 31, 1903.

Well-made skin in good condition; skull perfect.

Family CANIDÆ.

Genus UROCYON.

Urocyon cinereoargenteus borealis Merriam. Biol. Survey coll.

Proc. Biol. Soc. Wash., XVI, p. 74, May 29, 1903.

119725. Skin and skull. Adult male. Marlboro, 7 miles from Monadnock, New Hampshire. November 17, 1902. Collected by A. H. Thayer. Original number 3847x.

Well-made skin in good condition. Skull perfect, except for two perforations of palate and absence of three left upper incisors, first right and left upper premolars, first right lower premolar, and last left lower molar; postorbital processes broken.

Urocyon cinereoargenteus californicus Mearns.

Preliminary Diagnoses of New Mammals of the Genera Lynx, Urocyon, Spilogale, and Mephitis from the Mexican Boundary Line, p. 2, January 12, 1897. (Reprinted in Proc. U. S. Nat. Mus., XX, No. 1126, p. 459, December 24, 1897.)

=**Urocyon californicus** (Mearns). See Merriam, North Amer. Fauna, No. 16, p. 103, October 28, 1899.

62873. Skin and skull. Old adult male. San Jacinto Mountains (altitude 8,000 feet), Riverside County, California. July 6, 1895. Collected by A. W. Anthony. Original number 41. Catalogued August 27, 1895.

Well-made skin in good condition; skull perfect, two upper and three lower incisors lost, apparently due to age.

Urocyon catalinæ Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XVI, p. 74, May 29, 1903.

$\frac{33223}{45228}$. Skin and skull. Adult male. Catalina Island, Santa Barbara Islands, California. April 14, 1892. Collected by C. P. Streator. Original number 1801.

Well-made skin in good condition; skull perfect.

Urocyon clementæ Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XVI, p. 75, May 29, 1903.

92034. Skin and skull. Adult male. San Clemente Island, Santa Barbara Islands, California. June 5, 1897. Collected by H. A. Gaylord. Original number 1163x.

Well-made skin in good condition; skull perfect, except for absence of two right lower premolars and one upper and one lower incisor.

Urocyon guatemalæ Miller. Biological Survey collection.

Proc. Acad. Nat. Sci., Phila., 1899, pp. 278–280, July 26, 1899.

76723. Skin and skull. Adult male. Nenton, Guatemala. December 16, 1895. Collected by E. W. Nelson and E. A. Goldman. Original number 8801.

Well-made skin in good condition; skull perfect.

Vulpes (Urocyon) littoralis Baird.

Mammals of North America, p. 143, pls. 1 and 35, fig. 2, 1857.

=Urocyon littoralis (Baird). See Merriam, Proc. Biol. Soc. Wash., IV, p. 135, February 18, 1888.

$\frac{1351}{2154}$. Skin and skull. Adult. San Miguel Island, Santa Barbara Islands, California. January, 1856. Collected by Lieut. W. P. Trowbridge, U. S. A. Catalogued February 18, 1856.

Specimen was remade in January, 1902, into a modern study skin, and is in good condition, except a few slight imperfections about head. Skull perfect, except for a V-shaped piece of bone out of basioccipital. Second and third left upper incisors and last left upper molar are missing.

Baird listed two specimens, each designated by number, the one mentioned above, and No. $\frac{1447}{2275}$. The latter is an alcoholic specimen, with skull removed. The alcoholic specimen itself can not now be found. No. $\frac{1351}{2154}$ is regarded as the type because on Plate 35 of Baird's Mammals, the skull, No. 2154, is figured.

Urocyon parvidens Miller.

Proc. Acad. Nat. Sci. Phila., 1899, p. 276, July 26, 1899.

$\frac{11499}{37762}$. Skin and skull. Adult male, somewhat young. Merida, Yucatan, Mexico. Collected by Dr. A. Schott. Original number 385. Skin catalogued in 1873; skull, May 4, 1899.

Specimen made into a modern study skin and skull removed May, 1899. Skin in good condition; skull perfect except that both upper canines are broken off nearly to the alveoli, and foramen magnum has been slightly enlarged.

Urocyon littoralis santacruzæ Merriam. Biological Survey coll.

Proc. Biol. Soc. Wash., XVI, p. 75, May 29, 1903.

$\frac{34852}{47117}$. Skin and skull. Adult female. Santa Cruz Island, Santa Barbara Islands, California. July 11, 1892. Collected by C. P. Streator. Original number 1914.

Well-made skin in good condition; skull perfect, except for broken right upper canine.

Urocyon cinereoargenteus texensis Mearns.

Preliminary Diagnoses of New Mammals of the Genera Lynx, Urocyon, Spilogale and Mephitis, from the Mexican Boundary Line, p. 2, January 12, 1897. (Reprinted in Proc. U. S. Nat. Mus., XX, No. 1126, p. 459, December 24, 1897.)

$\frac{130}{1116}$. Adult skin and skull. San Pedro, near Eagle Pass, Texas. January, 1851. Collected by Dr. A. Schott, Mexican Boundary Survey, under Lieut. W. H. Emory, U. S. A. Catalogued March 31, 1853.

Specimen has been made into a modern study skin in good condition. All parts of the skull posterior to the tooth rows have been cut away; anterior parts perfect.

Urocyon californicus townsendi Merriam.

North Amer. Fauna, No. 16, p. 103, October 28, 1899.

14130. Skin. Adult. Baird, Shasta County, California. November 11, 1893. Collected by C. H. Townsend. Original number 49.

Well-made skin in good condition. Although Townsend collected skulls at Baird, there is no record of a skull for this skin. Catalogued January 19, 1884.

Genus VULPES.

Vulpes alascensis abietorum Merriam. Biological Survey coll.

Proc. Wash. Acad. Sci., II, pp. 669–670, December 28, 1900.

71197. Skull only. Adult male. Stuart Lake, British Columbia. Winter, 1893–4. Collected by A. C. Murray.

Skull perfect, except for absence of pterygoid processes and broken left upper canine.

Vulpes alascensis Merriam.

Proc. Wash. Acad. Sci., II, p. 668, December 28, 1900.

1420. Skull only. Old male. Andreafski, Alaska. February, 1880. Collected by E. W. Nelson. Original number 180. Catalogued July 24, 1884.

Skull perfect. Some of the teeth rather worn from age, especially the left upper canine and the first two pairs of upper premolars.

Vulpes beringensis Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, pp. 171–172, August 6, 1902.

47109. Skull only. Young adult female. Bering Island, Bering Sea. June 3, 1892. Collected by Dr. B. W. Evermann. Original number 19.

Skull perfect, except for absence of one upper incisor and first right and left lower premolars.

Vulpes cascadensis Merriam. Biological Survey collection.

Proc. Wash. Acad. Sci., II, pp. 665–666, pl. 36, fig. 3, December 28, 1900.

92767. Skin and skull. Young adult male. Trout Lake, base of Mount Adams, Washington. March 3, 1898. Collected by P. Schmid. Original number 1518x.

Well-made skin in good condition; skull perfect.

Vulpes hallensis Merriam. Biological Survey collection.

Proc. Wash. Acad. Sci., II, pp. 15–16, March 14, 1900.

98067. Skin and skull. Adult female. Hall Island, Bering Sea. July 14, 1899. Collected by Dr. C. Hart Merriam. Shot by W. B. Devereaux. Original number 2177 (Dr. A. K. Fisher).

Well-made skin in good condition; skull perfect, except for broken left upper canine.

Vulpes harrimani Merriam. Biological Survey collection.

Proc. Wash. Acad. Sci., II, pp. 14–15, March 14, 1900.

99626. Skin only. Adult. Kodiak Island, Alaska. 1899. Collected by Dr. C. Hart Merriam.

Cased skin, tanned; in good condition; feet missing.

Vulpes velox hebes Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, pp. 73–74, March 22, 1902.

108255. Skin and skull. Young adult male. Calgary, Alberta, Canada. October 8, 1900. Collected by W. G. Mackay and G. F. Dippie. Original number 560 (2890x).

Well-made skin in good condition; skull perfect.

Vulpes lagopus innuitus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, p. 170, August 6, 1902.

107626. Skin and skull. Adult female. Korogaro River, near Point Barrow, Alaska. June 27, 1898. Collected by E. A. McIlhenny. Original number 831 (2877x).

Well-made skin in good condition; skull perfect, except for absence of first left lower premolar.

Vulpes kenaiensis Merriam. Biological Survey collection.

Proc. Wash. Acad. Sci., II, p. 670, pl. 36, fig. 5, December 28, 1900.

96145. Skull only. Old male. Kenai Peninsula, Alaska, 1898. Collected by Dall De Weese.

Skull perfect, except for absence of first left upper premolar.

Vulpes macrourus Baird.

Stansbury's Exped. to Valley of Great Salt Lake, Utah, p. 309, May, 1852.

4107. Skin only. Adult. Valley of Great Salt Lake, Utah. 1849 or 1850. Collected by Captain Stansbury's Expedition. Original number "A". The specimen was purchased from hunters in the Salt Lake Valley. Catalogued June 26, 1860.

Specimen made over into modern study skin in fair condition. The left fore foot is the only foot having claws. The right ear is broken and rather mutilated. It is in an envelope attached to the skin.

In Baird's Mammals of North America, p. 131, the type is designated by the original number "A."

Vulpes muticus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, p. 74, March 22, 1902.

75828. Skin and skull. Adult male. Tracy, San Joaquin Valley, California. November 5, 1895. Collected by G. Leonard. Original number 6.

Well-made skin in good condition; skull perfect, except for slightly fractured left audital bulla and broken right outer upper incisor.

Vulpes necator Merriam. Biological Survey collection.

Proc. Wash. Acad. Sci., II, pp. 664–665, pl. 36, fig. 2, December 28, 1900.

$\frac{30735}{42635}$. Skin and skull. Young adult female. Whitney Meadows, near Mount Whitney, California. September 1, 1891. Collected by Dr. A. K. Fisher. Original number 940.

Well-made skin in good condition. Skull with brain-case badly shattered but repaired, leaving a large part of the right frontal and parietal absent; audital bullæ badly broken; palate fractured; pterygoids missing.

Vulpes macrotis neomexicanus Merriam. Biological Survey coll.

Proc. Biol. Soc. Wash., XV, p. 74, March 22, 1902.

98646. Skull only. Adult male. Band's ranch, San Andreas Range, New Mexico. April 4, 1899. Collected by C. M. Barber. Original number 2055x.

Skull perfect, except for absence of first right upper and lower premolars.

Vulpes pribilofensis Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, p. 171, August 6, 1902.

$\frac{30661}{42624}$. Skin and skull. Adult male. St. George Island, Pribilof Islands, Bering Sea. August 10, 1891. Collected by Dr. C. Hart Merriam. Original number 8.

Well-made skin in good condition; skull perfect, except for absence of one upper incisor.

Vulpes regalis Merriam. Biological Survey collection.

Proc. Wash. Acad. Sci., II, pp. 672–673, pl. 36, fig. 4, December 28, 1900.

$\frac{31697}{43655}$. Skin and skull. Adult male. Elk River, Minnesota. March 5, 1887. Collected by V. Bailey. Original number 659.

Well-made skin in good condition. Skull perfect, except for a few small perforations in rostrum; one lower incisor missing; upper incisors and right upper canine injured.

Vulpes lagopus ungava Merriam.

Proc. Biol Soc. Wash., XV, p. 170, August 6, 1902.

23195. Skull only. Adult male. Fort Chimo, Ungava, Labrador. Collected by L. M. Turner. Original number 2362. Catalogued January 15, 1889.

Skull nearly perfect; pterygoids chipped; third left lower premolar and second lower incisor broken off to roots.

Genus CANIS.

Canis estor Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XI, pp. 31–32, March 15, 1897.

57141. Skin and skull. Adult female. Noland ranch, San Juan River, Utah. November 20, 1893. Collected by J. A. Loring. Original number 1379.

Well-made skin in good condition; skull perfect.

Canis frustror Woodhouse.

Proc. Acad. Nat. Sci. Phila., V, p. 147. Recommended for publication February 4, 1851.

4105. Skin. Young. Red Fork of Arkansas River probably between 96° and 98° longitude, now Cimarron River, Oklahoma, about 100 miles west of the present Fort Gibson, Indian Territory. (See Reports Explorations and Surveys Pacific R. R., XI, 1859, p. 63, and map.) August 1850. Collected by Dr. S. W. Woodhouse on exploring expedition under command of Capt. L. Sitgreaves, U. S. A., and Lieut. I. C. Woodruff, U. S. A., in 1849 and 1850. (See p. 46, Rept. Expd. Zuni and Colorado rivers, Capt. L. Sitgreaves, 1853.) Catalogued June 26, 1860.

Specimen formerly mounted, but since made into a modern study skin. Baird in Mammals of North America and Woodhouse in the original description speak of skulls that have not yet lost their milk teeth. These skulls can not now be found nor is there any record of them in the Museum catalogue.

No type designated. The two specimens procured by Dr. S. W. Woodhouse, a male and a female, both young, do not appear to be mentioned by number in Baird's Mammals, but 4105 and 4106 are undoubtedly the two specimens that Doctor Woodhouse had. The entry of 4105 reads: "" " [*Canis latrans* written on line above] ♂ juv., Red Fork of Ark., Aug. 1850, Capt. Sitgreaves, Dr. Woodhouse, Type of *C. frustror*," all in the old original handwriting. The other specimen, 4106 ♀ juv., has the same data, but is not marked "Type of *C. frustror*."

Heretofore the type-locality of *Canis frustror* has been stated to be Fort Gibson, Indian Territory. This is the only locality mentioned in the original description, but that is where Dr. S. W. Woodhouse "first saw" the animal. He does not state where the specimens came from. That is found only by consulting the Museum catalogue.

Canis goldmani Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XVII, p. 157, October 6, 1904.

133204. Skin and skull. Adult female. San Vicente, Chiapas, Mexico. April 25, 1904. Collected by E. A. Goldman. Original number 16725.

Well-made skin in good condition; skull perfect, except for absence of first left upper premolar and crown of outer right upper incisor.

Canis lestes Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XI, pp. 25–26, March 15, 1897.

$\frac{24562}{32347}$. Skin and skull. Adult male. Toyabe Mountains, near Cloverdale, Nevada. November 21, 1890. Collected by V. Bailey. Original number 2223.

Well-made skin in good condition; skull perfect, except for absence of one lower incisor and last right lower molar.

Canis mearnsi Merriam.

Proc. Biol. Soc. Wash., XI, p. 30, March 15, 1897.

59899. Skin and skull. Young adult male. Quitoboquito, Pima County, Arizona. February 5, 1894. Collected by Dr. E. A. Mearns, U. S. A., and F. X. Holzner. Original number 2925. International Boundary Commission. Catalogued April 13, 1894.

Well-made skin in good condition; skull perfect, except for loss of first upper premolar, last upper and last lower molars on left side.

Canis microdon Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XI, pp. 29–30, March 15, 1897.

$\frac{27656}{39664}$. Skin and skull. Adult male. Mier, Tamaulipas, Mexico. April 28, 1891. Collected by W. Lloyd. Original number 478.

Well-made skin in good condition, except for small bare space on throat; skull perfect.

Canis pallidus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XI, pp. 24–25, March 15, 1897. Preoccupied by *Canis pallidus* Rüppell, Atlas zu Reise in nördl. Afrika, I, p. 33, 1826.

=**Canis nebracensis** Merriam. Science, new ser., VIII, p. 782, December 2, 1898.

77093. Skin and skull. Young adult male. Johnstown, Nebraska. March 12, 1896. Collected by E. E. Fast. Original number 5.

Well-made skin in good condition; skull perfect.

Canis peninsulæ Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XI, pp. 28–29, March 15, 1897.

74245. Skin and skull. Adult male. Santa Anita, Lower California, Mexico. May 15, 1895. Collected by J. E. McLellan. Original number 1354.

Well-made skin; pelage ragged; skull perfect, except for broken right outer incisor.

Canis nebracensis texensis Bailey. Biological Survey collection.

North Amer. Fauna, No. 25, pp. 175–177, October 24, 1905.

116277. Skin and skull. Young adult male. Forty-five miles southwest of Corpus Christi, Texas. December 14, 1901. Collected by J. M. Priour. Original number 3478x.

Well-made skin in good condition; skull perfect.

Canis vigilis Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XI, p. 33, March 15, 1897.

$\frac{32627}{44550}$. Skin and skull. Young adult female. Manzanillo, Colima, Mexico. February 6, 1892. Collected by E. W. Nelson. Original number 1840.

Well-made skin in good condition; several small bare spaces on underparts; skull perfect.

Family MUSTELIDÆ.

Genus LATAX.

Latax lutris nereis Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XVIII, p. 159, October 6, 1904.

133508. Complete disarticulated skeleton. Adult male. San Miguel Island, Santa Barbara Islands, California. July 2, 1904. Collected by G. M. McGuire. Original number 4690x.

Skull perfect, except for absence of last right and left lower molars and first left lower incisor.

Genus PUTORIUS.

Putorius richardsoni alascensis Merriam. Biological Survey coll.

North Amer. Fauna, No. 11, pp. 12–13, pl. 2, fig. 2, June 30, 1896.

=**Putorius cicognani alascensis** (Merriam). See Trouessart, Catalogus Mammalium, p. 277, 1897.

74423. Skin and skull. Adult male. Juneau, Alaska. August 22, 1895. Collected by C. P. Streator. Original number 4806.

Well-made skin in good condition; skull perfect.

Putorius arcticus Merriam.

North Amer. Fauna, No. 11, p. 15, pl. 2, figs. 2, 2*a*, June 30, 1896.

$\frac{14062}{23010}$. Skin and skull. Adult male. Point Barrow, Alaska. July 16, 1883. Collected by John Murdoch, U. S. Signal Service. Explorations in Alaska under Lieut. P. L. Ray, U. S. A. Original number 1672. Skin catalogued January 16, 1884; skull July 25, 1888.

Well-made skin in good condition. Skull nearly perfect; left malar broken; and a crack runs through right frontal and nasal.

Putorius culbertsoni Coues. Chirotypes.

U. S. Geol. Surv. of Terr., Misc. Pub. No. 8, Fur-Bearing Animals, p. 136, 1877.

=**Putorius longicauda** (Bonaparte). See Coues, *loc. cit.*

$\frac{4320}{37995}$. Skin and skull. Fort Laramie, Wyoming. December, 1859. Collected by Dr. F. V. Hayden. Exploration of headwaters of Missouri and Yellowstone, under Capt. W. F. Reynolds, U. S. A. Original number 75. Skin catalogued November 22, 1860; skull, January 22, 1902.

Specimen remade into a fairly good study skin in January, 1902, and skull removed. Tail lost, scorched about the rump; skull perfect.

The other chirotype, 4325, can not be found. The entry in the catalogue corresponding to that number is "*Putorius culbertsoni*, Ft. Union [now Fort Buford, North Dakota], Aug. 8.60, G. H. Trook."

Chirotypes designated by number. Coues gives the species as a synonym of *Putorius longicauda*, thus: "*Putorius culbertsoni*, Bd MSS. Mus. Smiths (labels of nos. 4320, 4325)."

Putorius frenatus goldmani Merriam. Biological Survey collection.

North. Amer. Fauna, No. 11, pp. 28–29, June 30, 1896.

77519. Skin and skull. Adult male. Pinabete, Chiapas, Mexico. February 10, 1896. Collected by E. A. Goldman. Original number 9279.

Well-made skin in good condition; skull with rostrum badly injured, lacking most of right nasal, upper part of right maxillary and postorbital processes; two outer upper incisors missing.

Putorius haidarum Preble. Biological Survey collection.

Proc. Biol. Soc. Wash., XII, pp. 169–170, August 10, 1898.

94430. Skin and skull. Adult male. Massett, Queen Charlotte Islands, British Columbia. March 17, 1898. Collected by Rev. J. H. Keen. Original number 1800x.

Well-made skin in good condition; skull perfect.

Putorius arcticus kadiacensis Merriam. Biological Survey coll.

North Amer. Fauna, No. 11, p. 16, June 30, 1896.

65290. Skin and skull. Young adult male. Kodiak Island, Alaska. April 25, 1894. Collected by B. J. Bretherton. Original number 304.

Well-made skin in good condition; skull perfect, except for broken supraoccipital, basioccipital, and right audital bulla; left outer upper incisor missing.

Putorius kaneii Baird.

Mammals of North America, p. 172, 1857.

$\frac{2330}{37990}$. Skin (summer pelage) and skull. Adult. Arikamtchitchi Island (Arikam Island), Bering Strait (see footnote in Baird's Mammals of North America, p. 173), Tchuktchi Country, Siberia. Collected by W. Stimpson; received from Capt. J. Rodgers, U. S. N. Original number 358. Skin catalogued March, 1857; skull, January 11, 1902.

Specimen was made into a fairly good modern study skin and skull removed in January, 1902. Brain case of skull broken away, anterior parts, however, quite complete.

No type specified. Baird listed two specimens, No. 1458 from Semipalatinsk, Siberia, in winter pelage, received from the Bremen Museum, through Dr. G. Hartlaub, and the above, No. 2330. Most of the description appears to be based upon summer pelages as in number 2330 and specimens from "among the collections of the North Pacific and Behring's Straits Expedition." Further on Baird says, "A winter specimen, 1458, from Semipalatinsk, Siberia, is very similar in size and the characters of the tail." This would indicate that 1458 was not considered quite typical and leaves 2330 as the type.

Putorius streatori leptus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XVI, pp. 76–77, May 29, 1903.

56800. Skin and skull. Young adult male. Silverton, Colorado. October 20, 1893. Collected by J. A. Loring. Original number 1185.

Well-made skin in good condition; skull perfect.

Putorius frenatus leucoparia Merriam. Biological Survey coll.

North Amer. Fauna, No. 11, pp. 29–30, June 30, 1896.

$\frac{34914}{47176}$. Skin and skull. Adult male. Patzcuaro, Michoacan, Mexico. July 27, 1892. Collected by E. W. Nelson. Original number 2960.

Well-made skin in good condition. Skull lacking most of brain-case except a fragment of the parietals and supraoccipital; rostrum, left zygoma, palate, and dentition intact; mandible intact except for absence of right coronoid.

Putorius xanthogenys oregonensis Merriam. Biol. Survey coll.

North Amer. Fauna, No. 11, pp. 25–26, June 30, 1896.

$\frac{32019}{43828}$. Skin and skull. Adult female. Grants Pass, Rogue River Valley, Oregon. December 19, 1891. Collected by C. P. Streator. Original number 1404.

Well-made skin in good condition; skull perfect, except for absence of first left upper premolar.

Putorius tropicalis perdus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, pp. 67–68, March 22, 1902.

100041. Skin and skull. Adult male. Teapa, Tabasco, Mexico. March 31, 1900. Collected by E. W. Nelson and E. A. Goldman. Original number 14074.

Well-made skin in good condition; skull perfect.

Putorius saturatus Merriam. Biological Survey collection.

North Amer. Fauna, No. 11, pp. 21–22, June 30, 1896.

65930. Skin and skull. Adult male. Siskiyou, Oregon. June 6, 1894. Collected by C. P. Streator. Original number 3905.

Well-made skin in good condition; skull perfect.

Putorius streatori Merriam. Biological Survey collection.

North Amer. Fauna, No. 11, pp. 13–14, pl. 2, figs. 5–6, June 30, 1896.

76646. Skin and skull. Adult male. Mount Vernon, Skagit Valley, Washington. February 29, 1896. Collected by D. H. Luckey. Original number 3.

Well-made skin in good condition; skull perfect.

Putorius tropicalis Merriam. Biological Survey collection.

North Amer. Fauna, No. 11, pp. 30–31, pl. 3, figs. 5–6, June 30, 1896.

54994. Skin and skull. Adult male. Jico, Vera Cruz, Mexico. July 9, 1893. Collected by E. W. Nelson. Original number 5195.

Well-made skin in good condition; skull perfect, except for absence of four upper incisors; right upper canine broken.

Putorius washingtoni Merriam. Biological Survey collection.

North Amer. Fanua, No. 11, pp. 18–19, pl. 4, figs. 3–4, June 30, 1896.

76322. Skin and skull. Adult male. Trout Lake, base of Mount Adams, Washington. December 15, 1895. Collected by D. N. Kaegi. Original number 2.

Well-made skin in good condition; skull perfect, except for absence of left outer upper incisor.

Genus LUTREOLA.

Lutreola vison ingens Osgood.

North Amer. Fauna, No. 19, p. 42, pl. 4, fig. 2, October 6, 1900.

6530. Skull only. Old adult, probably male. Fort Yukon, Alaska. February 15, 1862. Collected by Robert Kennicott. Original number 262. Catalogued in spring of 1865.

Skull perfect.

Lutreola vison lacustris Preble. Biological Survey collection.

North Amer. Fauna, No. 22, p. 66, October 31, 1902.

106872. Skin and skull. Young adult male. Echimamish River, Keewatin, Canada. September 14, 1900. Collected by E. A. and A. E. Preble. Original number 3518.

Well-made skin in good condition; skull perfect, except for broken tip of left nasal and slight fracture of left parietal.

Lutreola macrodon Prentiss.

Proc. U. S. Nat. Mus., XXVI, No. 1336, p. 887, fig. *a*, July 6, 1903.

115178. Fragments of skull. Pre-Columbian shell heaps, Brooklin, Hancock County, Maine. 1897. Collected by Drs. F. W. True and D. W. Prentiss, Jr.

"*Condition of type.*—Fragments of skull composed of the superior maxillæ, portions of the nasals, right zygoma, and palate extending 6 mm. back of molars. All the teeth are present on the right side, three incisors and one premolar on the left side. The teeth are in excellent condition except the canine, which is broken at the point, and portion of enamel missing. The bones are very brittle and of a yellowish color on their broken surface." Prentiss, *loc. cit.*

Genus MUSTELA.

Mustela americana abieticola Preble.

North Amer. Fauna, No. 22, p. 68, October 31, 1902.

$\frac{19256}{34962}$. Skin and skeleton. Adult male. Cumberland House, Saskatchewan, Canada. February, 1890. Collected by R. Mac Farlane. Original number 54. Catalogued January 17, 1891.

Rather poorly made skin, but in good condition. The entire skeleton is present. The digits of the fore feet, the middle and distal phalanges of the digits of the hind feet, and the last few caudal vertebræ are in the skin. The skull is slightly injured, posterior half of left zygoma broken, left audital bulla and adjoining portions of *basis cranii* broken.

Mustela americana actuosa Osgood.

North Amer. Fauna, No. 19, p. 43, pl. 7, fig. 2, October 6, 1900.

6043. Skull. Old adult male. Fort Yukon, Alaska. November, 1860. Collected by Robert Kennicott. Original number 1017. Catalogued April 18, 1863.

Skull nearly perfect; right malar lost, the two lower middle incisors and the first right upper premolar are wanting, and a U-shaped piece has been broken out of the basioccipital. The catalogue calls for skin 6413, but it can not be found.

Mustela nesophila Osgood. Biological Survey collection.

North Amer. Fauna, No. 21, pp. 33–34, pl. 5, figs. 3–4, September 26, 1901.

78066. Skull only. Adult male. Massett, Graham Island, Queen Charlotte Islands, British Columbia. Collected by Rev. J. H. Keen.

Skull earth or smoke stained; perfect, except for absence of incisors, left lower canine, two left and two right lower premolars, and last right lower molar.

Mustela caurina origenes Rhoads.

Proc. Acad. Nat. Sci. Phila., 1902, p. 458, September 30, 1902.

112170. Skin and skull. Young adult female. Marvine Mountain, Colorado. September 16, 1901. Collected by Ernest T. Seton. Catalogued October 14, 1901.

Well-made skin in good condition; skull perfect.

Genus SPILOGALE.

Spilogale ambigua Mearns.

Preliminary Diagnoses of New Mammals of the Genera Lynx, Urocyon, Spilogale, and Mephitis, from the Mexican Boundary Line, p. 3, January 12, 1897. (Reprinted in Proc. U. S. Nat. Mus., XX, No. 1126, p. 460, December 24, 1897.)

$\frac{20302}{35606}$. Skin and skull. Adult male. Eagle Mountain, Chihuahua, Mexico, about 4 miles south of monument No. 15, Mexican boundary line, lat. 31° 47′, long. 30° 15′. March 23, 1892. Collected by Dr. E. A. Mearns, U. S. A., and F. X. Holzner. Original number 1574. International Boundary Commission. Catalogued July 28, 1892.

Well-made skin in good condition. Skull nearly perfect; right canine and two adjacent incisors somewhat broken.

Spilogale angustifrons Howell. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, p. 242, December 16, 1902.

50825. Skin and skull. Adult male. Tlalpam, Federal District, Mexico. December 15, 1892. Collected by E. W. Nelson and E. A. Goldman. Original number 4035.

Well-made skin in good condition; skull perfect, except for slightly fractured nasals.

Spilogale angustifrons elata Howell. Biological Survey collection.

North Amer. Fauna, No. 26, pp. 27–28, pl. 9, figs. 7–9, November 24, 1906.

133186. Skin and skull. Adult male. San Bartolomé, Chiapas, Mexico. March 19, 1904. Collected by E. A. Goldman. Original number 16618.

Well-made skin in good condition; skull perfect.

Spilogale gracilis Merriam. Biological Survey collection.

North Amer. Fauna, No. 3, pp. 83–84, September 4, 1890.

$\frac{17986}{24897}$. Skin and skull. Adult male. Bottom of Grand Canyon of the Colorado, at altitude of 3,500 feet, north of San Francisco Mountain, Arizona. September 12, 1889. Collected by Dr. C. Hart Merriam and V. Bailey. Original number 451.

Well-made skin in good condition; skull perfect, except for a perforation of the inner wall of the right orbit.

Spilogale indianola Merriam.

North Amer. Fauna, No. 4, p. 10, October 8, 1890.

1621. Skull only. Young adult. Indianola, Matagorda Bay, Texas. Collected by J. H. Clark, old Mexican boundary survey. Catalogued February 15, 1855.

Skull perfect.

Spilogale phenax latifrons Merriam. Biological Survey collection.

North Amer. Fauna, No. 4, p. 15, October 8, 1890.

$\frac{17271}{24200}$. Skin and skull. Old female. Roseburg, Douglas County, Oregon. July 13, 1889. Collected by Dr. T. S. Palmer. Original number 216.

Well-made skin in good condition. Skull lacking right audital bulla, basioccipital, basisphenoid, pterygoids, and most of supraoccipital; zygomata broken; palate fractured; mandible missing.

Spilogale lucasana Merriam.

North Amer. Fauna, No. 4, p. 11, October 8, 1890.

$\frac{3970}{4279}$. Skin and skull. Adult. Cape St. Lucas, Lower California, Mexico. Collected by John Xantus. Original number $\frac{603}{610}$. Catalogued in October, 1860.

Specimen formerly mounted, but it is now a well-made skin in good condition; some hair is lost from the tail; skull perfect, except right upper canine is broken off at alveolus.

Spilogale microdon Howell. Biological Survey collection.

North Amer. Fauna, No. 26, pp. 34–35, pl. 10, figs. 4–6, November 24, 1906.

145887. Skin and skull. Adult male. Comondu, Lower California, Mexico. November 8, 1905. Collected by E. W. Nelson and E. A. Goldman. Original number 18501.

Well-made skin in good condition; skull perfect.

Spilogale ringens Merriam. Biological Survey collection.

North Amer. Fauna, No. 4, pp. 9–10, fig. 2 (p. 2), October 8, 1890.

=**Spilogale putorius** (Linnæus). See Howell, North Amer. Fauna, No. 26, p. 15, November 24, 1906.

$\frac{23182}{30642}$. Skin and skull. Adult female. Greensboro, Alabama. August 2, 1890. Collected by C. S. Brimley. Original number 50.

Well-made skin in good condition. Skull with numerous shot perforations; right audital bulla and most of right side of brain-case absent, left audital bulla injured, right coronoid broken.

Spilogale tenuis Howell. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, pp. 241–242, December 16, 1902.

99365. Skin and skull. Adult male. Arkins, Colorado. November 13, 1899. Collected by R. S. Weldon. Original number 2198x.

Well-made skin in good condition; skull perfect.

Spilogale angustifrons tropicalis Howell. Biological Survey coll.

Proc. Biol. Soc. Wash., XV, p. 242, December 16, 1902.

73523. Skin and skull. Adult male. San Mateo del Mar, Oaxaca, Mexico. May 16, 1895. Collected by E. W. Nelson and E. A. Goldman. Original number 7958.

Well-made skin in good condition; skull perfect, except for absence of left mastoid bulla, interorbital region considerably injured by parasites.

Genus MEPHITIS.

Mephitis estor Merriam. Biological Survey collection.

North Amer. Fauna, No. 3, pp. 81–82, pl. 10, figs. 1–4, September 4, 1890.

$\frac{17709}{24645}$. Skin and skull. Adult male. San Francisco Mountain, Arizona. August 17, 1889. Collected by V. Bailey. Original number 369.

Well-made skin in good condition; skull perfect.

Mephitis frontata Coues.

Bull. U. S. Geol. and Geog. Surv. Terr., 2d ser., No. 1, p. 7, fig. 1, 1875.

2232. Post-Pliocene skull. Old adult. Dales Cave, 3 miles from Lansburg, Pennsylvania. Collected by Secretary S. F. Baird. Catalogued March, 1856.

Skull in good condition for a subfossil; left zygoma lacking and right somewhat broken, two large holes in the brain-case dorsally and anteriorly, two upper and two lower incisors lacking.

Chincha occidentalis major Howell. Biological Survey collection.

North Amer. Fauna, No. 20, pp. 37–38, August 31, 1901.

=**Mephitis occidentalis major** (Howell). See Allen, Bull. Amer. Mus. Nat. Hist., XIV, p. 334, November 12, 1901.

92238. Skin and skull. Adult male. Fort Klamath, Oregon. January 5, 1898. Collected by B. L. Cunningham. Original number 80 (1188x).

Well-made skin in good condition; skull perfect, except for slightly broken left zygoma.

Mephitis milleri Mearns.

Preliminary Diagnoses of New Mammals of the Genera Mephitis, Dorcelaphus, and Dycotyles from the Mexican Border of the United States, p. 1, February 11, 1897. (Reprinted in Proc. U. S. Nat. Mus., XX, No. 1129, p. 467, December 24, 1897.)

=**Mephitis macroura milleri** (Mearns). See Allen, Bull. Amer. Mus. Nat. Hist., XIV, p. 334, November 12, 1901.

58851. Skin and skull. Adult male. Fort Lowell, near Tucson, Arizona. November 13, 1893. Collected by F. X. Holzner. Original number 1109. International Boundary Commission. Catalogued December 13, 1893.

Well-made skin in good condition; skull perfect.

Chincha occidentalis notata Howell. Biological Survey collection.

North Amer. Fauna, No. 20, pp. 36–37, pl. 3, fig. 2, August 31, 1901.

=**Mephitis occidentalis notata** (Howell). See Allen, Bull. Amer. Mus. Nat. Hist., XIV, p. 334, November 12, 1901.

87043. Skin and skull. Adult male. Trout Lake, Mount Adams, Washington. March 22, 1897. Collected by P. Schmid. Original number 243x.

Well-made skin in good condition; skull perfect, except for broken left mastoid bulla.

Mephitis occidentalis Baird.

Mammals of North America, p. 194, 1857.

2617. Skull. Adult, probably male. Petaluma, California. Collected by E. Samuels. Original number 837. Catalogued December 10, 1856.

Skull perfect except for loss of 15 mm. of right zygoma. There used to be a skin, No. 1944, marked in the catalogue "Destroyed Jan. 8, 1886."

No type designated. A table of detailed measurements is given of $\frac{1944}{2617}$, and this one should be regarded as the type. Four specimens are listed: 2031, skull from Santa Clara, California; 2434, skull; $\frac{1944}{2617}$, the above skin and skull both from Petaluma, and a fourth specimen, skin without number, from Steilacoom, Washington. Baird's brief diagnosis is based upon both cranial and skin characters, so that again preference must be given to $\frac{1944}{2617}$, the only skin with skull which he had.

Petaluma is regarded as the type locality by Miller and Rehn (Proc. Boston Soc. Nat. Hist., XXX, p. 214, December, 1901), and by Howell (North Amer. Fauna, No. 20, p. 34, August 31, 1901).

Chincha platyrhina Howell. **Biological Survey collection.**

North Amer. Fauna, No. 20, p. 39, August 31, 1901.

=**Mephitis platyrhina** (Howell). See Allen, Bull. Amer. Mus. Nat. Hist., XIV, p. 334, November 12, 1901.

$\frac{29884}{41351}$. Skin and skull. Adult male. South Fork of Kern River, 25 miles east of Kernville, California. July 5, 1891. Collected by V. Bailey. Original number 2998.

Well-made skin in good condition; skull perfect.

Genus CONEPATUS.

Conepatus filipensis Merriam. **Biological Survey collection.**

Proc. Biol. Soc. Wash., XV, pp. 163–164, August 6, 1902.

68172. Skin and skull. Adult male. Cerro San Felipe, Oaxaca, Mexico. August 24, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 6619.

Well-made skin in good condition; skull perfect.

Conepatus pediculus Merriam. **Biological Survey collection.**

Proc. Biol. Soc. Wash., p. 164, August 6, 1902.

116953. Skin and skull. Young adult male. Sierra Guadalupe, Coahuila, Mexico. April 25, 1902. Collected by E. W. Nelson and E. A. Goldman. Original number 15123.

Well-made skin in good condition; skull perfect.

Conepatus sonoriensis Merriam. **Biological Survey collection.**

Proc. Biol. Soc. Wash., XV, pp. 162–163, August 6, 1902.

95914. Skin and skull. Young adult female. Camoa, Rio Mayo, Sonora, Mexico. October 29, 1898. Collected by E. A. Goldman. Original number 13213.

Well-made skin in good condition; skull perfect.

Conepatus mesoleucus telmalestes Bailey. **Biological Survey coll.**

North Amer. Fauna, No. 25, pp. 203–205, fig. 24, October 24, 1905.

136551. Skin and skull. Adult male. Big Thicket, 7 miles northeast of Sour Lake, Texas. March 17, 1905. Collected by J. H. Gaut. Original number 3485.

Well-made skin in good condition; skull perfect.

Conepatus leuconotus texensis Merriam. **Biological Survey coll.**

Proc. Biol. Soc. Wash., XV, p. 162, August 6, 1902.

$\frac{34867}{47122}$. Skin and skull. Adult male. Brownsville, Texas. July 20, 1892. Collected by F. B. Armstrong. Original number 70.

Well-made skin in good condition; skull perfect, except for slightly broken right zygoma.

Conepatus tropicalis Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, pp. 164–165, August 6, 1902.

63650. Skin and skull. Male(?) adult. Motzorongo, Vera Cruz, Mexico. February 26, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 5903.

Well-made skin in good condition; skull perfect, except for absence of second left lower premolar and two lower incisors.

Genus TAXIDEA.

Taxidea berlandieri Baird.

Mammals of North America, p. 205, 1857.

=**Taxidea taxus berlandieri** (Baird). See Allen, Bull. Amer. Mus. Nat Hist., VII, p. 256, June 29, 1895.

1710. Skin (no skull). Male. Llano Estacado, Texas. May 8, 1855. Received from Capt. J. Pope, U. S. A. Catalogued in 1856.

Formerly mounted. Made into a fairly good study skin in February, 1902.

Baird's description is based upon one specimen, the above, designated by number.

Taxidea americana neglecta Mearns.

Bull. Amer. Mus. Nat. Hist., III, p. 250, June 5, 1891.

=**Taxidea taxus neglecta** (Mearns). See Miller and Rehn, Proc. Boston Soc. Nat. Hist., XXX, p. 218, December 27, 1901.

$\frac{3835}{4196}$. Skin and skull. Adult male. Fort Crook, Shasta County, California. March 25, 1859. Collected by John Feilner. Original number 313. Catalogued in 1860.

Well-made skin in good condition (skin remade in January, 1902). Skull nearly perfect, a rather large hole in right bulla; three left upper incisors, first right upper incisor, and last right lower molar lost.

Family PROCYONIDÆ.

Genus PROCYON.

Procyon lotor insularis Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XII, p. 17, January 27, 1898.

88978. Skin and skull. Old male. Maria Madre Island, Tres Marias Islands, Mexico. May 10, 1897. Collected by E. W. Nelson and E. A. Goldman. Original number 10985.

Well-made skin in good condition; skull perfect.

Procyon psora pacifica Merriam. Biological Survey collection.

North Amer. Fauna, No. 16, p. 107, October 28, 1899.

93137. Skin and skull. Adult. Kichelos Lake, Washington. January 15, 1898. Collected by C. Hansen. Original number 1409x.

Well-made skin in good condition; skull perfect, except for slight fracture of right nasal and perforation in right auditał bulla.

Procyon pallidus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XIII, pp. 151-152, June 13, 1900.

99272. Skin and skull. Adult female. New River, Colorado Desert, California. October 16, 1899. Collected by F. Stephens. Original number 3022 (2246x).

Well-made skin in good condition. Skull perfect, except for absence of second left upper incisor and last right upper molar; right audital bulla broken.

Procyon pygmæus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XIV, p. 101, July 19, 1901.

108511. Skin and skull. Young adult male. Cozumel Island, Yucatan, Mexico. April 14, 1901. Collected by E. W. Nelson and E. A. Goldman. Original number 14698.

Well-made skin in good condition; skull perfect.

Genus NASUA.

Nasua narica molaris Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, p. 68, March 22, 1902.

$\frac{32630}{44553}$. Skin and skull. Adult male. Manzanillo, Colima, Mexico. February 7, 1892. Collected by E. W. Nelson. Original number 1844.

Well-made skin in good condition; skull perfect, except for absence of second right and left upper premolars and three upper and four lower incisors.

Nasua nelsoni Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XIV, p. 100, July 19, 1901.

108520. Skin and skull. Old male. Cozumel Island, Yucatan, Mexico. April 8, 1901. Collected by E. W. Nelson and E. A. Goldman. Original number 14673.

Well-made skin in good condition; skull perfect, except for broken right audital bulla and perforation in palate.

Genus BASSARISCUS.

Bassaris raptor Baird.

Report Mexican Boundary Survey, II, Pt. 2, p. 19, January, 1859.

=**Bassariscus raptor** (Baird). See Merriam, Proc. Biol. Soc. Wash., XI, p. 186, July 1, 1897.

$\frac{87}{976}$. Skin, skull, and nearly all of the skeleton except the usual leg bones left in the skin. Killed in a hen roost near Washington, D. C., April 23, 1852. It was supposed to have been brought from California and kept in captivity, whence it escaped. A collar mark shows plainly around the neck. Catalogued April 26, 1852.

Specimen has been made into a modern study skin and is in fair condition, although the hair has a dirty yellow color, looking as though at one time preserved in alcohol. The skull is in fair condition. It is somewhat cracked posteriorly, the left malar is wanting, and the following teeth are missing: Third

upper premolar, left side; all the lower incisors and the last lower molar, right side. All the bones of the skeleton are apparently present except the bones from the forearm distally and from the leg distally.

Type indirectly designated by number, and the collar mark and original label leave no doubt as to the specimen Baird had in mind.

Bassariscus saxicola Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XI, pp. 185–186, July 1, 1897.

79031. Skin and skull. Adult female. Espiritu Santo Island, Lower California, Mexico. August 19, 1895. Collected by J. E. McLellan. Original number 1438.

Well-made skin in good condition; skull perfect.

Genus BASSARICYON.

Bassaricyon gabbii Allen.

Proc. Acad. Nat. Sci. Phila., 1876, p. 23, pl. 1, fig. 1, April 18, 1876; Proc. Acad. Nat. Sci. Phila., 1877, pp. 267, 268, and pl. 2 of what was supposed to be the entire animal, but what in reality is an illustration of *Nasua narica*.

14214. Skull. Adult. Talamanca, Costa Rica. Collected by Prof. W. M. Gabb. Original number 44. Catalogued November 19, 1874.

A U-shaped piece is lacking from the basioccipital, and there is a large hole in the basisphenoid between the pterygoids. The following teeth are present in the upper jaw: The last three teeth on the right side, the last tooth and the second from the last and the third from the last on the left side. The following teeth are missing in the lower jaw: In the left side the last molar, the third premolar, and the third incisor; on the right side the second incisor.

According to the catalogue there should be a skin bearing No. 12237. It has never been found in the Museum collection. In a letter dated May 12, 1908, Dr. J. A. Allen remarks: "In reference to the type of *Bassaricyon gabbii*, I never saw a skin belonging to the type skull. Through some error in cataloguing a skin of *Nasua narica* purported to belong to the skull, and I figured it as such, being at that time unfamiliar with the species of *Nasua*. Careful search was made for the missing skin after the error was discovered, but I am sure it was never found. My knowledge of the external characters of *Bassaricyon* is based on a living specimen of *B. alleni* which I saw some years ago in the London Zoo."

Type designated by number on page 20 of the original description.

Family URSIDÆ.

Genus URSUS.

Ursus horribilis alascensis Merriam. Cotypes. Biol. Survey coll.

Proc. Biol. Soc. Wash., X, p. 74, April 13, 1896.

In the description of this subspecies no type was designated. In the collection are 6 skulls from Norton Sound, Alaska, which Dr. C. Hart Merriam had at the time the original description was written. Three of them were left unlabeled and one of these designated by No. 76470 is mentioned as not typical. The 3 remain-

ing skulls bear the name *Ursus alascensis* in Doctor Merriam's handwriting and are therefore considered as cotypes of this form. These 3 skulls are:

76465. Skull only. Young adult female. Shaktolik River, Norton Sound, Alaska. Received January, 1896. Original number 1.

Skull perfect, except for repaired fracture of right zygoma, broken right upper and left lower canines, and loss of second right upper and first right lower premolars.

76467. Skull only. Adult male. Head of Koyuk River, Norton Sound, Alaska. Collected May, 1893. Original number 3.

Skull perfect, except for loss of 4 middle upper incisors, first and second right and first left upper premolars, 3 lower incisors, first and second right and first left lower premolars.

This is the only adult male skull labeled as *Ursus alascensis* by Doctor Merriam at the time the description was published and is the only one showing all the characters mentioned.

76469. Skull only. Young (permanent dentition in place but entirely unworn). Probably male. Shaktolik Hills, Norton Sound, Alaska. June, 1890. Original number 5.

Skull perfect, except for loss of 2 upper and 1 lower incisors, first and second right and left upper premolars, and first right and left lower premolars.

Ursus horribilis californicus Merriam.

Proc. Biol. Soc. Wash., X, p. 76, fig. 15, April 13, 1896.

3630. Skull only. Old adult. Monterey, California. Collected by A. S. Taylor. Catalogued October 7, 1859.

Skull in good condition. It is old and most of the teeth are much worn. The canines are split and cracked in the usual way of large teeth; the second lower molar on the left side is nearly decayed away. The whole ascending ramus of the right half of the mandible and the right pterygoid bone are lacking, probably shot away; otherwise skull perfect.

No type designated, but a skull is figured (fig. 15) in the original description, and this skull is regarded as the type. The number 3630 on the skull is quite legible in the figure.

Ursus (Euarctos) carlottæ Osgood. Biological Survey collection.

North Amer. Fauna, No. 21, pp. 30–32, pl. 4, fig. 1, September 26, 1901.

87620. Skull only. Adult male. Massett, Graham Island, Queen Charlotte Islands, British Columbia. November, 1896. Collected by Rev. J. H. Keen. Original number 497x.

Skull perfect, except for absence of first right lower incisor and first right upper premolar.

Ursus dalli Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., X, pp. 71–73, pl. 5, fig. 1; pl. 6, fig. 5; figs. 8–9 in text, April 13, 1896.

75048. Skull only. Old male. Yakutat Bay, Alaska. September 8, 1895. Collected by chief of Yakutat Indians. Original number 2.

Skull perfect.

Ursus americanus eremicus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XVII, pp. 154–155, October 6, 1904.

116952. Skin and skull. Adult female. Sierra Guadalupe, Coahuila, Mexico. April 21, 1902. Collected by E. W. Nelson and E. A. Goldman. Original number 15111.

Well-made skin in good condition, except for bare spot on abdomen; skull perfect except slightly injured second and third upper incisors; canines cracked.

Ursus eulophus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XVII, p. 153, October 6, 1904.

81102. Skull only. Adult male. Admiralty Island, Alaska. 1896. Collected by G. T. Emmons.

Skull perfect, except for large bullet hole passing from left parietal through brain-case and out of right frontal.

Ursus floridanus Merriam.

Proc. Biol. Soc. Wash., X, p. 81, April 13, 1896.

3484. Skull only. Old adult (male, *fide* Merriam). Key Biscayne, Dade County, Florida. May 21, 1858. Collected by G. Wurdemann. Original number 4. Catalogued March 4, 1859.

Skull without lower jaw, left zygoma entirely broken away, also anterior half of right zygoma. A large hole through the interorbital region, but without injury to the frontal region above it or the palate below it. The second upper incisor of the right side and the small second premolar on both sides lacking, left upper canine somewhat broken.

Ursus dalli gyas Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, p. 78, March 22, 1902.

91669. Skull only. Adult male. Pavlof Bay, Alaska Peninsula. 1897. Collected by W. Pavlof. Original number 1052x.

Skull perfect, except for absence of first right and left upper premolars, second left upper incisor, and first and second right lower incisors.

Ursus horribilis horræus Baird. Lectotype.

Report Mexican Boundary Survey, II, Pt. 2, p. 24, January, 1859.

990. Skull only. Adult male. Old copper mines, near the Rio Mimbres, Grant County, New Mexico, near the present location of Georgetown. Collected by J. H. Clark. Catalogued November 1, 1852.

Skull perfect, except for loss of 3 upper incisors, 3 of the small upper premolars, 5 lower incisors, and first left lower premolar; both upper canines, and left lower canine, and last right lower molar broken off to alveoli; absence of right coronoid process of mandible, and repaired fracture of right angular and condyloid processes.

No type was designated in the original description. The above specimen was designated as "the type", that is a lectotype, by Dr. C. Hart Merriam (Proc.

Biol. Soc. Wash., X, p. 75, April 13, 1896). Secretary Baird had two other specimens in his hands at the time the subspecies was described, No. 995, skull only, a young male, with same data as the lectotype, and figured *op. cit.*, pl. 20; and No. $\frac{1047}{2086}$ (incorrectly designated by Secretary Baird as No. 147), an adult male from Los Nogales, Sonora, Mexico. In many respects No. 1047 might be considered the type, as the diagnosis of the form and much of the description is based upon this specimen. The skin was in poor condition in Secretary Baird's time and has apparently been destroyed; the skull is in fair condition. This specimen was evidently considered the type by Miller and Rehn (Proc. Boston Soc. Nat. Hist., XXX, p. 233, December, 1901) as the type-locality given by them is Los Nogales, Sonora, Mexico.

Written on the skull in old writing is: | "Said to have a | touch of the Grizzly | by an old hunter | hair brown however" | J. H. C. | "Probably a cross" |

Ursus kenaiensis Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XVII, p. 154, October 6, 1904.

128672. Skull only. Adult female. Cape Elizabeth, Kenai Peninsula, Alaska. 1903. Collected by C. A. Lambert. Original number 4205x.

Skull perfect.

Ursus kidderi Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, pp. 78–79, March 22, 1902.

116562. Skin and skull. Young adult male. Chinitna Bay, Alaska Peninsula, Alaska. June 9, 1901. Collected by J. H. Kidder. Original number 3661x.

Tanned skin in good condition; skull perfect.

Ursus middendorffi Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., X, pp. 69–71, pl. 4, figs. 2–3; pl. 5, fig. 2; pl. 6, fig. 2; fig. 7 in text, April 13, 1896.

54793. Skull only. Adult male. Kodiak Island, Alaska. July 3, 1893. Collected by B. J. Bretherton. Original number 176.

Skull perfect, except for fractured left squamosal and left audital bulla and a small bullet hole passing from the left frontal through the brain-case and out of the right parietal.

Ursus horribilis phæonyx Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XVII, p. 154, October 6, 1904.

133231. Skin and skull. Old female. Near head of Comet Creek, tributary of Fortymile Creek, Alaska. July 12, 1903. Collected by W. H. Osgood. Original number 2684.

Tanned skin in good condition; foot pads missing; skull perfect, except for absence of first left lower incisor; most of molariform teeth worn to roots.

Order INSECTIVORA.

Family ERINACEIDÆ.

Genus PODOGYMNURA.

Podogymnura truei Mearns.

Proc. U. S. Nat. Mus., XXVIII, No. 1402, p. 437, May 13, 1905.

125286. In alcohol (skull removed). Adult female. Mount Apo (at 6,000 feet), southern Mindanao, Philippine Islands. June 25, 1904. Collected by Dr. E. A. Mearns, U. S. A. Original number 5667. Catalogued December 13, 1904.

Alcoholic in good condition; anterior half of skull in good condition; brain-case badly broken and in many fragments.

Family TALPIDÆ.

Genus SCAPANUS.

Scalops æneus Cassin.

Proc. Acad. Nat. Sci. Phila., VI, p. 299, this paper was reported favorably for publication February 22, 1853.

=**Scapanus townsendi** (Bachman). See True, Proc. U. S. Nat. Mus., XIX, No. 1101, p. 51; pp. 58 and 64. December 21, 1896.

3725. Skin (no skull). Oregon. Collected by the U. S. Exploring Expedition. Catalogued December 20, 1859.

In good state of preservation, but rather badly made up. As Dr. True states (*loc. cit.*), the specimen has every appearance of having been discolored by immersion in alcohol or other preserving fluid.

The original description says, "A single specimen, apparently fully adult, is in the collection of the Exploring Expedition, labeled as having been obtained in Oregon." No. 3725 is undoubtedly this "single specimen."

Scapanus alpinus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XI, p. 102, April 26, 1897.

79967. Skin and skull. Adult male. Crater Lake, Mount Mazama, Oregon. August 18, 1896. Collected by V. Bailey. Original number 5784.

Well-made skin in good condition; skull perfect.

Scalops californicus Ayres.

Proc. California Acad. Nat. Sci., I, 1854–1857, p. 54, description presented May 21, 1855.

=**Scapanus latimanus** (Bachman). See Osgood, Proc. Biol. Soc. Wash., XX, p. 52, April 18, 1907.

3111. Skeleton. Adult. San Francisco, California. Collected by Dr. W. O. Ayres. Catalogued February, 1857.

A partially cleaned skeleton, in fair condition, all parts of which appear to be present except the right manus and forearm. Skull is well cleaned and perfect

except loss of last left upper molar. The side view of this skull is figured by True (Proc. U. S. Nat. Mus., XIX, No. 1101, pl. 3, fig. 3).

This skeleton is one of Dr. Ayres's original specimens, and probably the only one of them now in existence. It seems well to treat it as a type, although it was not so indicated by the original describer.

Scapanus orarius True.

Proc. U. S. Nat. Mus., XIX, No. 1101, December 21, 1896, p. 52.

$\frac{1381}{37434}$. Skin and skull. Adult female. Shoalwater Bay, Washington. August 30, 1855. Collected by Dr. J. G. Cooper. Skin catalogued February 26, 1856; skull, May 23, 1898.

Specimen recently made into a good study skin. The posterior half of the cranium is broken off, though most of it is still present; the part of the skull anterior to the middle of the cranium and the mandibles, perfect.

Type designated by number 381, an error for 1381.

Scapanus truei Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XI, p. 102, April 26, 1897.

79290. Skin and skull. Adult. Lake City, Modoc County, California. June 15, 1896. Collected by C. P. Streator. Original number 5289.

Well-made skin in good condition; skull perfect, except for slight irregularity of foramen magnum.

Genus DYMECODON.

Dymecodon pilirostris True.

Proc. U. S. Nat. Mus., IX, p. 97, September 25, 1886.

$\frac{15291}{22139}$. Alcoholic (skull removed). Immature male. Mouth of Yeddo Bay, Yenosima, Japan. Collected by Prof. E. S. Morse. Received from the Boston Society of Natural History February 19, 1878. Catalogued December 21, 1885.

The alcoholic is in rather bad condition. Considerable hair has slipped from the belly. It has been split open from the chin nearly to the anus, to permit the removal of the skull and shoulder girdle. The right zygoma is lacking and the left basal portion of the brain case is injured, both ascending rami of the mandible broken.

The single specimen is referred to by number in the original description.

Genus NEÜROTRICHUS.

Urotrichus gibbsii Baird.

Mammals of North America, p. 76, pl. 28, 1857.

=Neürothrichus gibbsii (Baird). See Günther, Proc. Zool. Soc. London, 1880, pl. 42, June 1, 1880.

$\frac{662}{1843}$. Skin and skull. Immature. White River, Cascade Mountains, Washington. July 15, 1854. Collected by George Gibbs.

Original number 15. Received from Dr. George Suckley. Catalogued May 7, 1855.

Skin in rather poor condition, badly made, and left fore foot detached. Skull quite fragmentary and of value only to show the teeth, some of which are of the deciduous set. All the tooth rows are intact.

Baird had but one specimen, which he designated by number.

Neürotrichus gibbsi major Merriam. Biological Survey collection.

North Amer. Fauna, No. 16, p. 88, October 28, 1899.

65321. Skin and skull. Adult male. Carberry ranch, Shasta County, California. May 18, 1894. Collected by C. P. Streator. Original number 3789.

Well-made skin in good condition; skull perfect.

Family SORICIDÆ.

Genus CROCIDURA.

Crocidura andamanensis Miller.

Proc. U. S. Nat. Mus., XXIV, No. 1269, p. 777, pl. 41, 6, 6*a*, 6*b*, May 28, 1902.

111825. Skin and skull. Adult male. South Andaman Island, Andaman Islands. January 16, 1901. Collected by Dr. W. L. Abbott. Original number 851. Catalogued August 15, 1902.

Well-made skin in good condition; skull perfect.

Crocidura caudata Miller.

Proc. Biol. Soc. Wash., XIV, p. 42, April 25, 1901.

103302. In alcohol (skull removed). Young adult female. Palermo, Sicily. June 21, 1900. Collected by Dane Coolidge. Original number 1365. Catalogued October 3, 1900.

Alcoholic in fair condition; intestines have been removed, some hair has slipped from left leg. Tip of tail is flattened by some accident. Skull rather badly broken about the right posterior half of brain-case.

Crocidura lignicolor Miller.

Proc. Wash. Acad. Sci., II, p. 39, March 30, 1900.

62180. Skin (skull lost). Adult female. Jungles east of Maralbashi on the Yarkand River, Eastern Turkestan. January 10, 1894. Collected by Dr. W. L. Abbott. Catalogued May 16, 1895.

Well-made skin in good condition. The Museum catalogue calls for a skull, which can not be found.

Crocidura mimula Miller.

Proc. Biol. Soc. Wash., XIV, p. 95, fig. 1*b*, June 27, 1901.

105801. Skin and skull. Adult female. Zuberwangen, St. Gallen, Switzerland. December 1, 1900. Collected by Ernst H. Zollikofer. Original number 192. Catalogued June 4, 1901.

Well-made skin in good condition; skull perfect, except for loss of right tympanic ring.

Crocidura nicobarica Miller.

Proc. U. S. Nat. Mus., XXIV, No. 1269, p. 776, May 28, 1902.

111788. In alcohol (skull removed). Adult female. Great Nicobar, Nicobar Islands. March 15, 1901. Collected by Dr. W. L. Abbott. Original number 931. Catalogued August 14, 1901.

Specimen well preserved. It contains a large fetus. Tip of tail, hind feet and ankles, left fore foot and tip of snout have been somewhat nibbled, probably by ants. Skull perfect.

Crocidura shantungensis Miller.

Proc. Biol. Soc. Wash., XIV, p. 158, August 9, 1901.

86151. Skin and skull. Adult. Chimeh, Shantung, northern China. June, 1898. Collected by Paul D. Bergen. Catalogued January 19, 1899.

Well-made skin in good condition. Skull was formerly in the skin, but has been removed; all the parts posterior to the upper tooth rows are broken away; anterior portion and mandible complete.

Crocidura sicula Miller.

Proc. Biol. Soc. Wash., XIV, p. 41, April 25, 1901.

103301. Skin and skull. Adult male. Palermo, Sicily. June 20, 1900. Collected by Dane Coolidge. Original number 1332. Catalogued October 3, 1900.

Well-made skin in good condition; skull perfect.

Genus MYOSOREX

Myosorex muricauda Miller.

Proc. Wash. Acad. Sci., II, p. 645, fig. 42, December 28, 1900.

83809. In alcohol (skull removed). Adult male. Mount Coffee, Liberia, West Africa. April 5, 1897. Collected by R. P. Currie. Original number 32. Catalogued September 23, 1897.

Alcoholic, in good condition; skull removed and perfect.

Genus NEOMYS.

Neomys fodiens minor Miller.

Proc. Biol. Soc. Wash., XIV, p. 45, April 25, 1901.

101311. Skin and skull. Adult male. Montréjeau, Hautes Pyrennes, France (in foothills of Pyrennes). July 8, 1899. Collected by Robert T. Young. Original number 641. Catalogued October 11, 1899.

Well-made skin in good condition; skull perfect, except for loss of both tympanic rings.

Genus BLARINA.

Blarina alticola Merriam. Biological Survey collection.

North. Amer. Fauna, No. 10, pp. 27–28, December 31, 1895.

52047. Skin and skull. Adult male. Mount Popocatepetl, Mexico. February 25, 1893. Collected by E. W. Nelson. Original number 4396.

Well-made skin in good condition; skull perfect.

Blarina angusticeps Baird.

Mammals of North America, p. 47, 1857.

=**Blarina brevicauda** (Say). See Merriam, North Amer. Fauna, No. 10, pp. 6 and 10, December 31, 1895.

$\frac{1318}{2120}$. Skin and skull. Burlington, Vermont. Collected by Prof. Z. Thompson. Original number 203. Catalogued February, 1856.

Skin in fair condition; some hair has sloughed from the sides and belly. Skull has several teeth lacking from the upper jaw, and the tympanic, periotic, and mastoid bones of both sides absent.

Baird had but one specimen, which he specified by number.

Blarina berlandieri Baird.

Mammals of North America, p. 53, pl. 28, No. 2159, 1857.

2159. In alcohol, skull not removed. Vicinity of Matamoras, Mexico. Probably collected by Dr. J. L. Berlandier. Received from Lieut. D. N. Couch, U. S. A. Catalogued February 14, 1857.

In good condition, save for some sloughing of hair about the belly. The skull remains inside. Baird's figure of the skull must have been made from one of the paratypes, but the lips have been loosened in order that teeth may be seen.

Four specimens, $\frac{6412}{1793}$, $\frac{6413}{1794}$, 2159, and 2160, all from the same locality, are listed in the original description. Of these 2159 is here regarded as the type, since it is figured on pl. 28.

Blarina exilipes Baird.

Mammals of North America, p. 51, pl. 28, No. 2157, 1857.

=**Blarina parva** (Say). See Merriam, North Amer. Fauna, No. 10, pp. 6–7 and 17, December 31, 1895.

2157. In alcohol, skull not removed. Washington, Mississippi. Collected by Col. B. L. C. Wailes, U. S. A. Catalogued February 14, 1857.

No specimen is designated as the type; eight specimens are listed by Baird, of which No. 2157 is figured on pl. 28. For that reason it is considered as the type.

Specimen rather the worse for shedding of hair on the posterior parts of body. The skull has not been removed, so that a skull of one of the paratypes is probably figured.

Blarina floridana Merriam. Biological Survey col

North Amer. Fauna, No. 10, p. 19, pl. 1, fig. 7, December 31, 1895.

$\frac{16510}{23937}$. In alcohol, skull removed. Chester Shoal, 11 miles n Cape Canaveral, Florida. April 22, 1889. Collected by Green. Original number 44.

Specimen in good condition. Skull perfect, except for broken supra angular processes of mandible missing.

Blarina fossor Merriam. Biological Survey col

North Amer. Fauna, No. 10, p. 28, December 31, 1895.

68545. Skin and skull. Adult female. Mount Zempoaltepe aca, Mexico. July 10, 1894. Collected by E. W. Nels E. A. Goldman. Original number 6419.

Well-made skin in good condition; skull perfect.

Blarina mexicana goldmani Merriam. Biological Survey coll

North Amer. Fauna, No. 10, p. 25, December 31, 1895.

70244. Skin and skull. Young adult male. Mountains nea pancingo, Guerrero, Mexico. December 23, 1894. Collec E. W. Nelson and E. A. Goldman. Original number 7231.

Well-made skin in good condition; skull perfect.

Blarina mexicana machetes Merriam. Biological Survey coll

North Amer. Fauna, No. 10, p. 26, December 31, 1895.

71456. Skin and skull. Adult female. Mountains near Ozol Oaxaca, Mexico. March 26, 1895. Collected by E. W. and E. A. Goldman. Original number 7723.

Well-made skin in good condition; skull perfect.

Blarina magna Merriam. Biological Survey coll

North Amer. Fauna, No. 10, pp. 28–29, pl. 1, fig. 10, December 31, 1895

68575. Skin and skull. Adult male. Totontepec, Oaxaca, M July 24, 1894. Collected by E. W. Nelson and E. A. Go Original number 6493.

Well-made skin in good condition; skull perfect.

Blarina mayensis Merriam. Biological Survey coll

Proc. Wash. Acad. Sci., III, p. 559, November 29, 1901.

108087. Skin and skull. Adult female. Chichenitza, Yu Mexico. February 5, 1901. Collected by E. W. Nels E. A. Goldman. Original number 14495.

Well-made skin in good condition; skull perfect, except for absence occipital and part of supraoccipital.

Blarina (Soriciscus) mexicana Coues.

Bull. U. S. Geol. and Geog. Surv., III, p. 652, May 15, 1877.

$\frac{3625}{4438}$. Skin and skull. Jalapa, Vera Cruz, Mexico. Collected by R. Montis d'Oca. Skin catalogued March 18, 1859; skull September, 1861.

Skin in fair condition, considering the time at which it was collected; skull perfect, except the posterior part of the cranium.

Blarina nelsoni Merriam. Biological Survey collection.

North Amer. Fauna, No. 10, pp. 26–27, December 31, 1895.

65437. Skin and skull. Adult female. Volcano of Tuxtla, Vera Cruz, Mexico. May 13, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 6253.

Well-made skin in good condition; skull perfect.

Blarina obscura Merriam. Biological Survey collection.

North Amer. Fauna, No. 10, p. 23, December 31, 1895.

55634. Skin and skull. Young adult female. Tulancingo, Hidalgo, Mexico. August 27, 1893. Collected by E. W. Nelson. Original number 5377.

Well-made skin in good condition; skull perfect, except for slightly broken exoccipital, angular process of left mandible missing.

Blarina carolinensis peninsulæ Merriam. Biological Survey coll.

North Amer. Fauna, No. 10, pp. 14–15, December 31, 1895.

=**Blarina brevicauda peninsulæ** (Merriam). See Trouessart, Catalogus Mammalium, p. 188, 1897.

70874. Skin and skull. Adult male. Miami River, Dade County, Florida. March 2, 1895. Collected by J. A. Loring. Original number 2777.

Well-made skin, with small abdominal patch of hair sloughed; skull perfect, except for absence of left audital bulla.

Blarina mexicana peregrina Merriam. Biological Survey collection.

North Amer. Fauna, No. 10, pp. 24–25, December 31, 1895.

68317. Skin and skull. Adult male. Mountains 15 miles west of Oaxaca, Oaxaca, Mexico. September 12, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 6748.

Well-made skin in good condition; skull perfect.

Blarina soricina Merriam. Biological Survey collection.

North Amer. Fauna, No. 10, pp. 22–23, pl. 1, fig. 9, December 31, 1895.

50762. Skin and skull. Adult male. Tlalpam, Valley of Mexico, Mexico. December 5, 1892. Collected by E. W. Nelson. Original number 3989.

Well-made skin in good condition; skull perfect.

Blarina telmalestes Merriam. **Biological Survey collection.**

North Amer. Fauna, No. 10, pp. 15–16, pl. 2, fig. 5, December 31, 1895.

71823. Skin and skull. Adult female. Lake Drummond, Dismal Swamp, Virginia. June 6, 1895. Collected by Dr. A. K. Fisher. Original number 1775.

Well-made skin in good condition; skull perfect.

Genus NOTIOSOREX.

Sorex (Notiosorex) crawfordi Coues.

Bull. U. S. Geol. and Geog. Surv., III, pp. 646 and 651, May 15, 1877.

= Notiosorex crawfordi (Coues). See Merriam, North Amer. Fauna, No. 10, p. 32, December 31, 1895.

$\frac{2653}{4543}$. In alcohol, skull removed. Fort Bliss, New Mexico (near El Paso, Texas). Collected by Dr. S. W. Crawford, U. S. A. Alcoholic catalogued April 25, 1857; skull, September, 1861.

Body in alcohol in very poor condition. At some time the alcohol had been allowed to evaporate, so that everything about the specimen is now hard and shrunken. It is practically a mummy preserved in alcohol. Skull perfect.

Sorex (Notiosorex) evotis Coues.

Bull. U. S. Geol. and Geog. Surv., III, p. 652, May 15, 1877.

= Notiosorex crawfordi evotis (Coues). See Merriam, North Amer. Fauna, No. 10, p. 34, December 31, 1895.

9066. Skin (no skull). Along the Rio Mazatlan, Sinaloa, Mexico. February, 1868. Collected by Ferdinand Bischoff. Explorations in the North Pacific. Catalogued May 31, 1868.

All parts of skin present but it is poorly made up; tail not skinned out; left hind foot and right fore foot present, but broken off from the skin. The specimen looks as if it had originally been made up with part of the skull in it, which had subsequently been removed and lost. Coues evidently had the skull, but no mention of it is made in the Museum Catalogue.

Notiosorex gigas Merriam. **Biological Survey collection.**

Proc. Biol. Soc. Wash., XI, pp. 227–228, July 15, 1897.

88012. Skin and skull. Adult female. Mountains at Milpillas, near San Sebastian, Jalisco, Mexico. March 15, 1897. Collected by E. W. Nelson and E. A. Goldman. Original number 10706.

Well-made skin in good condition; skull perfect.

Genus SOREX.

Sorex obscurus alascensis Merriam. **Biological Survey collection.**

North Amer. Fauna, No. 10, pp. 76–77, December 31, 1895.

73539. Skin and skull. Young adult female. Yakutat, Alaska. July 10, 1895. Collected by C. P. Streator. Original number 4676.

Well-made skin in good condition; skull perfect.

Sorex navigator alaskanus Merriam. Biological Survey collection.

Proc. Wash. Acad. Sci., II, p. 18, March 14, 1900.

97713. Skin and skull. Adult male. Point Gustavus, Glacier Bay, Alaska. June 12, 1899. Collected by Dr. A. K. Fisher. Original number 2058.

Well-made skin in good condition; skull perfect.

Neosorex albibarbis Cope.

Proc. Acad. Nat. Sci. Phila., 1862, p. 188, ordered published April 29, 1862.

=**Sorex albibarbis** (Cope). See Merriam, Proc. Biol. Soc. Wash., VII, p. 25, April, 1892.

11239. In alcohol, skull not removed. Adult female. Profile Lake, New Hampshire. September, 1859. Collected by Prof. E. D. Cope. Catalogued between February and May, 1873.

Specimen in fair condition. Skull not removed.

No type designated. Cope took two specimens. The above seems to be one of them. The entry in the original catalogue reads: "*Neosorex albi****is* (the omitted letters belong to a word root probably intended to mean 'cheek' instead of 'beard'), Profile Lake, N. H., type." The handwriting is entirely different from any of the other handwritings in the catalogue.

Sorex (Atophyrax) bendirii albiventer Merriam. Biol. Survey coll.

North Amer. Fauna, No. 10, pp. 97–98, December 31, 1895.

66198. Skin and skull. Adult male. Lake Cushman, Olympic Mountains, Washington. July 7, 1894. Collected by C. P. Streator Original number 4021.

Well-made skin in good condition; skull perfect.

Sorex (Microsorex) alnorum Preble. Biological Survey collection.

North Amer. Fauna, No. 22, pp. 72–73, October 31, 1902.

107014. Skin and skull. Adult female. Robinson Portage, Keewatin, Canada. June 27, 1900. Collected by E. A. and A. E. Preble. Original number 2662.

Well-made skin in good condition; skull perfect.

Sorex araneus alticola Miller.

Proc. Biol. Soc. Wash., XIV, p. 43, April 25, 1901.

=**Sorex araneus nuda** Fatio. See Mottaz, Mém. Soc. Zool. France, XX, p. 26, September, 1907.

85930. Skin and skull. Adult male (not female as in original description). Meiringen, Switzerland. October 17, 1898. Collected by J. A. Loring. Original number 5731 (not 5781, as in original description). Catalogued December 27, 1898.

Well-made skin in good condition, except small bare spot on right flank; skull perfect.

Sorex amœnus Merriam. **Biological Survey collection.**

North Amer. Fauna, No. 10, pp. 69–70, December 31, 1895.

=**Sorex vagrans amœnus** (Merriam). See Merriam, *op. cit.*, No. 16, p. 87, October 28, 1899.

$\frac{29784}{41863}$. Skin and skull. Adult male. Mammoth Pass, head of Owens River, east slope Sierra Nevada, California. July 22, 1891. Collected by E. W. Nelson. Original number 1129.

Well-made skin in good condition; skull perfect.

Sorex personatus arcticus Merriam. **Biological Survey collection.**

Proc. Wash. Acad. Sci., II, p. 17, March 14, 1900.

99305. Skin and skull. Adult female. St. Michael, Alaska. September 14, 1899. Collected by W. H. Osgood. Original number 910.

Well-made skin in good condition; skull perfect.

Sorex bairdi Merriam. **Biological Survey collection.**

North Amer. Fauna, No. 10, pp. 77–78, pl. 7, figs. 3–3*a*, December 31, 1895.

$\frac{17414}{24318}$. Skin and skull. Adult female. Astoria, Oregon. August 2, 1889. Collected by Dr. T. S. Palmer. Original number 270.

Well-made skin in good condition; skull perfect.

Sorex californicus Merriam. **Biological Survey collection.**

North Amer. Fauna, No. 10, pp. 80–81, pl. 12, figs. 6–7, December 31, 1895.

$\frac{32578}{44426}$. Skin and skull. Adult male. Walnut Creek, Contra Costa County, California. February 15, 1892. Collected by C. P. Streator. Original number 1583.

Well-made skin in good condition; skull perfect.

Sorex saussurei caudatus Merriam. **Biological Survey collection.**

North Amer. Fauna, No. 10, pp. 84–85, December 31, 1895. Preoccupied by *Sorex caudatus* Hodgson, Horsfield's Cat. Mamm. Mus. E. India Co., p. 135, 1851.

=**Sorex saussurei mutabilis** Merriam. Science, new ser., VIII, p. 782, December 2, 1898.

69600. Skin and skull. Young adult female. Reyes, Oaxaca, Mexico. October 21, 1894. Collected by E. W. Nelson. Original number 6963.

Well-made skin in good condition; skull perfect.

Sorex dobsoni Merriam. **Biological Survey collection.**

North Amer. Fauna, No. 5, pp. 33–34, pl. 4, fig. 2, July 30, 1891.

=**Sorex vagrans dobsoni** (Merriam). See Merriam, *op. cit.*, No. 10, p. 68, December 31, 1895.

$\frac{24274}{31678}$. Skin and skull. Adult female. Sawtooth (also called Alturas) Lake, Idaho. October 3, 1890. Collected by Dr. C. Hart Merriam and V. Bailey. Original number 1929.

Well-made skin in good condition; skull lacking entire brain-case and left angular process of mandible, otherwise complete.

Sorex longicauda elassodon Osgood. Biological Survey collection.

North Amer. Fauna, No. 21, pp. 35–36, September 26, 1901.

100597. Skin and skull. Young adult male. Cumshewa Inlet, Moresby Island, Queen Charlotte Islands, British Columbia. June 13, 1900. Collected by W. H. Osgood and E. Heller. Original number 1030.

Well-made skin in good condition; skull perfect.

Sorex araneus euronotus Miller.

Proc. Biol. Soc. Wash., XIV, p. 44, April 25, 1901.

101321. Skin and skull. Adult male. Montréjeau, Hautes Pyrennes, France (in foothills of Pyrennes). July 8, 1899. Collected by Robert T. Young. Original number 642. Catalogued October 11, 1899.

Well-made skin in good condition; skull perfect.

Sorex (Microsorex) eximius Osgood. Biological Survey collection.

North Amer. Fauna, No. 21, p. 71, September 26, 1901.

107126. Skin and skull. Adult female. Tyonek, Cook Inlet, Alaska. September 14, 1900. Collected by W. H. Osgood and E. Heller. Original number 1395.

Well-made skin in good condition; skull perfect.

Sorex fimbripes Bachman.

Journ. Acad. Nat. Sci. Phila., VII, Pt. 2, p. 391, pl. 24, fig. 8, 1837.

=**Sorex personatus** I. Geoffroy. See Miller, North Amer. Fauna, No. 10, p. 53, December 31, 1895.

84556. In alcohol, skull not removed. "Was found [by Prof. Walter R. Johnson] on the high table-land on a branch of Drury's Run [Pennsylvania], a tributary of the west bank of the Susquehannah River." Catalogued April 29, 1898.

Condition of the specimen poor; most of the hair on the posterior half of body lacking, and the cheeks have been split open in order to expose the teeth.

The specimen was found in the collection in the early part of 1898 in a bottle with an old-style Museum label, without number, tied around the top, bearing the name "*Sorex fimbripes* (type)." Tied on the specimen itself is an old parchment label with the words "*Sorex fimbripes.* Type" written on it. The writing is perfectly legible, but very faint, and is not likely to last another quarter or half a century. The parchment has to be dried in order to read it. On April 29, 1898, this specimen was entered in the Museum catalogue and given the present number, 84556. No original data accompany the specimen to show where it came from, so that the locality has to be taken from Bachman's description. The writing of the old Museum label and parchment tag is unidentifiable; both labels were written many years ago and evidently by some one who knew the history of the specimen.

Sorex fisheri Merriam. Biological Survey collection.

North Amer. Fauna, No. 10, p. 86, pl. 4, fig. 4, December 31, 1895.

75166. Skin and skull. Adult male. Lake Drummond, Dismal Swamp, Virginia. October 11, 1895. Collected by Dr. A. K. Fisher. Original number 1800.

Well-made skin in good condition; skull perfect.

Sorex glacialis Merriam. Biological Survey collection.

Proc. Wash. Acad. Sci., II, p. 16, March 14, 1900.

97709. Skin and skull. Adult male. Point Gustavus, Glacier Bay, Alaska. June 12, 1899. Collected by Dr. A. K. Fisher. Original number 2056.

Well-made skin in good condition; skull perfect.

Sorex godmani Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XI, pp. 229–230, July 15, 1897.

77044. Skin and skull. Adult female. Volcan Santa Maria, Quezaltenango, Guatemala. January 28, 1896. Collected by E. W. Nelson and E. A. Goldman. Original number 9239.

Well-made skin in good condition; skull perfect.

Sorex haydeni Baird.

Mammals of North America, p. 29, pl. 27, 1857.

=**Sorex personatus** I. Geoffroy. See Miller, North Amer. Fauna, No. 10, p. 53, December 31, 1895.

1685. In alcohol, skull not removed. Fort Union, Nebraska (now Fort Buford, North Dakota). 1855. Collected by Dr. F. V. Hayden. Catalogued October 23, 1856.

Specimen in fair condition; lips loosened and left cheek cut in order to expose all the teeth.

No type designated. Baird mentions three specimens, Nos. 1684 and 1685, from Fort Union, and No. 2048 from Fort Pierre, Nebraska; No. 1685 is here regarded as the type because it is figured on pl. 27.

Sorex hoyi Baird.

Mammals of North America, p. 32, pl. 28, No. 1688, 1857.

1688. In alcohol. Adult male. Racine, Wisconsin. Collected by Dr. P. R. Hoy. Catalogued October 23, 1856.

Specimen is rather stiff and more or less shrunken, but it is otherwise in good condition. The skull has never been removed, but the lips have been loosened in order to expose the front teeth.

No type designated. Two specimens are listed by number in the original description, 1688 and $\frac{632}{1783}$. As the former is figured on pl. 28, it is regarded as the type.

Sorex idahoensis Merriam. Biological Survey collection.

North Amer. Fauna, No. 5, pp. 32–33, pl. 4, fig. 1, July 30, 1891.

=**Sorex personatus** I. Geoffroy. See Merriam, *op. cit.*, No. 10, p. 54, December 31, 1895.

23627/30946. Skin and skull. Adult female. Timber Creek, Salmon River Mountains, Idaho. August 26, 1890. Collected by Dr. C. Hart Merriam and V. Bailey. Original number 1674.

Well-made skin in good condition; skull perfect.

Sorex obscurus longicauda Merriam. Biological Survey collection.

North Amer. Fauna, No. 10, p. 74, December 31, 1895.

74711. Skin and skull. Young adult male. Wrangel, Alaska. September 9, 1895. Collected by C. P. Streator. Original number 4891.

Well-made skin in good condition; skull perfect.

Sorex tenellus lyelli Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, p. 75, March 22, 1902.

109530. Skin and skull. Young adult male. Mount Lyell, Tuolumne County, California. August 29, 1901. Collected by Dr. W. K. Fisher. Original number 2275.

Well-made skin in good condition; skull perfect.

Sorex macrodon Merriam. Biological Survey collection.

North Amer. Fauna, No. 10, p. 82, pl. 7, figs. 2–2*a*; pl. 12, figs. 12–13, December 31, 1895.

58272. Skin and skull. Young adult male. Orizaba, Vera Cruz, Mexico. January 26, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 5759.

Well-made skin in good condition; skull perfect.

Sorex macropygmæus Miller.

Proc. Biol. Soc. Wash., XIV, p. 158, August 9, 1901.

84012. Skin and skull. Adult male. Petropaulski, Kamchatka. September 23, 1897. Collected by Marie Stejneger (Mrs. Leonhard Stejneger). Original number 8019 (Dr. L. Stejneger). Catalogued February 28, 1898.

Fairly well-made skin, much contracted posteriorly; skull perfect.

Sorex montereyensis Merriam. Biological Survey collection.

North Amer. Fauna, No. 10, p. 79, December 31, 1895.

32000/44810. Skin and skull. Adult male. Monterey, California. October 1, 1891. Collected by V. Bailey. Original number 3336.

Well-made skin in good condition; skull perfect, except for fractured supraoccipital.

Sorex monticolus Merriam. **Biological Survey collection.**

North Amer. Fauna, No. 3, pp. 43–44, fig. 1, September 4, 1890.
= **Sorex vagrans monticola** (Merriam). See Merriam, *op. cit.*, No. 10, p. 69, December 31, 1895.

[illegible]. Skin and skull. Adult male. San Francisco Mountain, Arizona. August 28, 1889. Collected by Dr. C. Hart Merriam and V. Bailey. Original number 406.

Well-made skin in good condition; skull perfect, except for a small perforation in the palate and a larger irregular one in the upper side of the brain-case; angular processes of mandible missing.

Sorex tenellus myops Merriam. **Biological Survey collection.**

Proc. Biol. Soc. Wash., XV, p. 76, March 22, 1902.

$\frac{29559}{41634}$. Skin and skull. Adult female. White Mountains, California. July 13, 1891. Collected by E. W. Nelson. Original number 1101.

Well-made skin; tail complete, but detached at base; skull perfect.

Sorex tenellus nanus Merriam. **Biological Survey collection.**

North Amer. Fauna, No. 10, pp. 81–82, pl. 8, figs. 5–5*a*, December 31, 1895.

73773. Skin and skull. Adult female. Estes Park, Colorado. August 3, 1895. Collected by E. A. Preble. Original number 567.

Well-made skin in good condition; skull perfect, except for broken supraoccipital.

Neosorex navigator Baird.

Mammals of North America, p. 11, pl. 26, 1857.
= **Sorex (Neosorex) palustris navigator** (Baird). See Merriam, North Amer. Fauna, No. 10, p. 92, December 31, 1895.

$\frac{629}{1786}$. Skin and skull. Fort Vancouver, Washington. According to labels and record in catalogue. Probably northern Idaho. See Merriam, *loc. cit.* Collected by Dr. J. G. Cooper. Northern Pacific Railroad Survey. Catalogued April 18, 1855.

Skin in bad condition, almost broken in two in the middle, anterior portion alone showing the hair; feet intact, also tail, which has never been skinned out; skull in good condition except for a break in the right occipital region.

Baird's single specimen is designated by number.

Sorex nevadensis Merriam. **Biological Survey collection.**

North Amer. Fauna, No. 10, pp. 71–72, December 31, 1895.

$\frac{24881}{32302}$. Skin and skull. Adult male. Reese River, Nevada. November 20, 1890 (not November 24, 1890, as in original description). Collected by V. Bailey. Original number 2150.

Well-made skin in good condition; skull perfect, except for absence of angular processes of mandible.

Sorex oreopolus Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., VII, p. 173, September 29, 1892.

$\frac{33663}{45698}$. Skin and skull. Adult male. Sierra Nevada de Colima, Jalisco, Mexico; altitude, 10,000 feet. April 22, 1892. Collected by E. W. Nelson. Original number 2517.

Well-made skin in good condition, skull perfect.

Sorex orizabæ Merriam. Biological Survey collection.

North Amer. Fauna, No. 10, p. 71, December 31, 1895.

53633. Skin and skull. Adult female. Mount Orizaba, Puebla, Mexico. April 24, 1893. Collected by E. W. Nelson. Original number 4733.

Well-made skin in good condition; skull practically complete, although bisected in the interorbital region.

Sorex ornatus Merriam. Biological Survey collection.

North Amer. Fauna, No. 10; pp. 79–80, pl. 8, figs. 3–3*a*, December 31, 1895.

$\frac{31333}{43198}$. Skin and skull. Adult male. San Emigdio Canyon, Mount Pinos, California. October 19, 1891. Collected by E. W. Nelson. Original number 1328.

Well-made skin in good condition; skull perfect, except for absence of right audital bulla, basioccipital and some adjacent parts.

Sorex pachyurus Baird.

Mammals of North America, p. 20, pl. 27, 1857.
=**Sorex richardsoni** Bachman. See Miller, North Amer. Fauna, No. 10, p. 48, December, 1895.

1674. Skeleton, formerly in alcohol. Pembina, North Dakota (not Minnesota, as stated by Baird, *loc. cit.*). Collected by Charles Cavileer. Catalogued October 23, 1856.

Skeleton in fair condition; all parts of it seem to be present.

No type designated by Baird, who mentioned three specimens, the above, in alcohol at that time, and two skins, 626 from Pembina, and 638 from Ripley, Minnesota. As no. 1674 is figured on pl. 27, it is here considered the type.

Sorex pacificus Coues.

Bull. U. S. Geol. and Geog. Surv., III, p. 650, May 15, 1877.

3266. Skin with fragment of skull inside. Fort Umpqua, Oregon. Received from Dr. E. B. Vollum. Catalogued in March, 1858.

Skin in poor condition; torn about the mouth so as to expose what teeth are present, the unicuspids only; no filling; tail not skinned out; hair everywhere intact.

Sorex (Atophyrax) bendirii palmeri Merriam. Biol. Survey coll.

North Amer. Fauna, No. 10, p. 97, pl. 12, figs. 1–3, December 31, 1895.

$\frac{17331}{24263}$. Skin and skull. Old female. Astoria, Oregon. July 29, 1889. Collected by Dr. T. S. Palmer. Original number 256.

Well-made skin in good condition: skull perfect, except for absence of right audital bulla.

Sorex longicauda prevostensis Osgood. Biological Survey coll.

North Amer. Fauna, No. 21, p. 35, September 26, 1901.

100618. Skin and skull. Adult male. Prevost Island, Queen Charlotte Islands, British Columbia. July 3, 1900. Collected by W. H. Osgood and E. Heller. Original number 1089.

Well-made skin in good condition: skull perfect, except for absence of left audital bulla.

Sorex pribilofensis Merriam. Biological Survey collection.

North Amer. Fauna, No. 10, p. 87, pl. 9, figs. 3–3a, December 31, 1895.

30911. In alcohol. Adult female. St. Paul Island, Pribilof Islands, Bering Sea. July 29, 1891. Collected by Dr. C. Hart Merriam.

Specimen in good condition; skull not removed, apparently slightly fractured.

Sorex salvini Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XI, p. 229, July 15, 1897.

77035. Skin and skull. Adult female. Calel, Guatemala, 10,200 feet altitude. January 12, 1896. Collected by E. W. Nelson and E. A. Goldman. Original number 9057.

Well-made skin in good condition; skull perfect.

Sorex saussurei Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., VII, pp. 173–174, September 29, 1892.

$\frac{33667}{45702}$. Skin and skull. Adult female. Sierra Nevada de Colima, Jalisco, Mexico; altitude, 8,000 feet. April 23, 1892. Collected by E. W. Nelson. Original number 2538.

Well-made skin in good condition; skull perfect.

Sorex sclateri Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XI, p. 228, July 15, 1897.

75872. Skin and skull. Adult female. Tumbala, Chiapas, Mexico. October 23, 1895. Collected by E. W. Nelson and E. A. Goldman. Original number 8567.

Well-made skin in good condition; skull perfect.

Sorex shastensis Merriam. Biological Survey collection.

North Amer. Fauna, No. 16, p. 87, October 28, 1899.

95450. Skin and skull. Adult. Wagon camp, Mount Shasta, California. September 26, 1898. Collected by W. H. Osgood. Original number 317.

Well-made skin in good condition; skull perfect.

Sorex alascensis shumaginensis Merriam. Biological Survey coll.

Proc. Wash. Acad. Sci., II, p. 18, March 14, 1900.

=**Sorex obscurus shumaginensis** (Merriam). See Osgood, North Amer. Fauna, No. 24, p. 50, November 23, 1904.

97993. Skin aud skull. Adult male. Popof Island, Shumagin Islands, Alaska. July, 1899. Collected by De Alton Saunders. Original number 2210 (Dr. A. K. Fisher).

Well-made skin in good condition; skull perfect, except for absence of right audital bulla.

Sorex vagrans similis Merriam. Biological Survey collection.

North Amer. Fauna, No. 5, pp. 34–35, pl. 4, fig. 3, July 30, 1891.

=**Sorex obscurus** Merriam. See Merriam, *loc. cit.*, No. 10, pp. 72–73, pl. 8, figs. 1–1*a*, December 31, 1895.

$\frac{23625}{30943}$. Skin and skull. Adult female. Timber Creek, Salmon River Mountains, Idaho. August 26, 1890. Collected by Dr. B. H. Dutcher, U. S. A. Original number 1670.

Well-made skin in good condition; skull perfect, except for broken supraoccipital.

Sorex sphagnicola Coues.

Bull. U. S. Geol. and Geog. Surv., III, p. 650, May 15, 1877.

6361. Skin (no skull). Vicinity of Fort Liard, British Columbia, Canada. Collected by W. L. Hardisty. Catalogued in April, 1863.

Specimen in very poor condition; skin without filling and completely torn in two at the middle; both front feet missing; tail and hind feet present.

Sorex stizodon Merriam. Biological Survey collection.

North Amer. Fauna, No. 10, p. 98, December 31, 1895.

75885. Skin and skull. Adult female. San Cristobal, Chiapas, Mexico. September 25, 1895. Collected by E. W. Nelson and E. A. Goldman. Original number 8473.

Well-made skin in good condition; skull perfect.

Sorex personatus streatori Merriam. Biological Survey collection.

North Amer. Fauna, No. 10, pp. 62–63, December 31, 1895.

73537. Skin and skull. Adult male. Yakutat, Alaska. July 9, 1895. Collected by C. P. Streator. Original number 4674.

Well-made skin in good condition; skull perfect.

Sorex suckleyi Baird.

Mammals of North America, p. 18, pl. 27, No. 1677, 1857.

=**Sorex vagrans** Baird. See Merriam, North Amer. Fauna, No. 10, p. 67, December 31, 1895.

1677. In alcohol. Fort Steilacoom, Puget Sound, Washington. 1856. Collected by Dr. George Suckley. Northern Pacific R. R. Survey. Catalogued October 23, 1856.

Specimen is in fair condition; some hair has fallen from the back. The skull has not been removed (and the skull of a paratype is the one probably figured), but the lips have been cut loose and the left cheek split so that all the teeth may be seen.

Baird had seven specimens from four different localities. The description is based upon nos. 362 and 1677. As the latter is figured on pl. 27 it is here taken as the type.

Sorex tenellus Merriam. Biological Survey collection.

North Amer. Fauna, No. 10, p. 81, pl. 12, figs. 8–9, December 31, 1895.

$\frac{25083}{32496}$. Skin and skull. Adult. Summit of Alabama Hills, near Lone Pine, California. December 22, 1890. Collected by E. W. Nelson. Original number 131.

Well-made skin in good condition; skull complete, but with a large section of the brain-case broken away.

Sorex thompsoni Baird.

Mammals of North America, p. 34, pl. 27, No. 1686, 1857.

=Sorex hoyi Baird. See Miller, North Amer. Fauna, No. 10, pp. 36 and 43, December 31, 1895.

1686. In alcohol. Burlington, Vermont. Collected by Prof. Zadock Thompson. Catalogued October 23, 1856.

Alcoholic in fair condition; some sloughing of hair about the belly; skull not removed, but lips loosened to expose the teeth.

No type designated. Three specimens listed, the above, and 247 from Zanesville, Ohio, and 2062 from Halifax, Nova Scotia.

As 1686 is figured on pl. 27, it is here regarded as the type. The skull figured on the same plate is probably one of the paratypes.

Sorex trowbridgii Baird. Cotypes.

Mammals of North America, p. 13, pl. 26, 1857.

$\frac{813}{3088}$. Skin and skull. Astoria, mouth of Columbia River, Oregon. Collected by James Wayne. Received from Lieut. W. P. Trowbridge, U. S. A. Skin catalogued July, 1855, skull January, 1857.

All parts of the skin are present, but it is poorly made up and not in good condition. The skull is badly cleaned and more or less broken about the cranium, and the right half of the mandible is missing.

967. Skin (no skull). Same data as the above, with the addition that it was collected on June 10, 1855. Catalogued November, 1855.

The skin of the second cotype is even worse than that of the first. It evidently contained a skull, which has been removed and lost.

Baird lists four specimens by number, the above two and two from Steilacoom, Washington. From his remarks on page 15 it is clear that the first two form the basis of his description. On pl. 26 one of the Oregon specimens is figured (see explanation of plates, p. 742).

Sorex tundrensis Merriam. Biological Survey collection.

Proc. Wash. Acad. Sci., II, pp. 16–17, March 14, 1900.

99286. Skin and skull. Adult. St. Michael, Alaska. September 13, 1899. Collected by W. H. Osgood. Original number 902.

Well-made skin in good condition; skull perfect.

Sorex vagrans Baird.

Mammals of North America, p. 15, pl. 26, No. 1675, 1857.

1675. In alcohol. Adult male. Shoalwater Bay, Washington. Received from Dr. J. G. Cooper. Catalogued October 23, 1856.

Specimen entirely devoid of hair, otherwise its preservation is good. The skull has not been removed (so that the skull of a paratype is probably the one that is figured), but the lips have been loosened in order to expose the teeth.

No type designated. Baird had seven specimens from four different localities. The above being figured on pl. 26, is here taken as the type.

Sorex vancouverensis Merriam. Biological Survey collection.

North Amer. Fauna, No. 10, pp. 70–71, December 31, 1895.

71913. Skin and skull. Adult male. Goldstream, Vancouver Island, British Columbia. May 10, 1895. Collected by C. P. Streator. Original number 4592.

Well-made skin in good condition; skull perfect.

Sorex obscurus ventralis Merriam. Biological Survey collection.

North Amer. Fauna, No. 10, p. 75, December 31, 1895.

68342. Skin and skull. Adult male. Cerro San Felipe, Oaxaca, Mexico. August 26, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 6636.

Well-made skin in good condition; skull perfect, except for absence of angular processes of mandible.

FAMILY TUPAIIDÆ.

Genus TUPAIA.

Tupaia ferruginea batamana Lyon.

Proc. U. S. Nat. Mus., XXXI, No. 1502, p. 656, January 16, 1907.

142151. Skin and skull. Adult female. Senimba Bay, Batam Island, Rhio-Linga Archipelago. September 15, 1905. Collected by C. Boden Kloss. Original number 2. Catalogued January 8, 1906.

Well-made skin in good condition; skull perfect.

Tupaia bunoæ Miller.

Proc. Wash. Acad. Sci., II, p. 229, August 20, 1900.

101640. Skin and skull. Adult female. Pulo Bunoa, Tambelan Islands, South China Sea. August 5, 1899. Collected by Dr. W. L. Abbott. Catalogued January 19, 1900.

Well-made skin in good condition; skull perfect.

Tupaia carimatæ Miller.

Proc. U. S. Nat. Mus., XXXI, No. 1481, p. 61, July 23, 1906.

125123. Skin and skull. Adult male. Telok Edar, Karimata Island, off west coast of Borneo. September 2, 1904. Collected by Dr.

W. L. Abbott. Original number 3716. Catalogued December 8, 1904.

Well-made skin in good condition; skull perfect, except loss of ascending portion of left half of mandible, loss of left m^1, and a few shot holes in cranium.

Tupaia castanea Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 54, November 6, 1903.

115608. Skin and skull. Adult female. Pulo Bintang, Rhio-Linga Archipelago. August 11, 1902. Collected by Dr. W. L. Abbott. Original number 1872. Catalogued December 31, 1902.

Well-made skin in good condition; skull perfect, except that most of the ascending portion of right half of mandible is broken away and the last two teeth in right half of mandible are missing.

Tupaia cervicalis Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 59, November 6, 1903.

121754. Skin and skull. Adult male. Tana Bala, Batu Islands, off west coast of Sumatra. February 14, 1903. Collected by Dr. W. L. Abbott. Original number 2294. Catalogued August 1, 1903.

Well-made skin in good condition; skull perfect.

Tupaia chrysogaster Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 58, pl. 10, fig. 1, November 6, 1903.

121572. Skin and skull. Adult female. North Pagi Islands, off west coast of Sumatra. November 21, 1902. Collected by Dr. W. L. Abbott. Original number 2078. Catalogued July 29, 1903.

Well-made skin in good condition; skull perfect.

Tupaia chrysomalla Miller.

Proc. Wash. Acad. Sci., II, p. 232, August 20, 1900.

101710. Skin and skull. Adult female. Pulo Siantan, Anamba Islands, South China Sea. August 24, 1899. Collected by Dr. W. L. Abbott. Catalogued January 19, 1900.

Well-made skin in good condition; skull perfect.

Tupaia discolor Lyon.

Proc. U. S. Nat. Mus., XXXI, No. 1498, p. 602, December 18, 1906.

124703. Skin and skull. Adult female. Tanjong Rengsam, island of Banka, east of Sumatra. May 24, 1904. Collected by Dr. W. L. Abbott. Original number 3262. Catalogued November 29, 1904.

Well-made skin in good condition; skull perfect.

Tupaia inflata Lyon.

Proc. U. S. Nat. Mus., XXXI, No. 1498, p. 600, December 18, 1906.

124709. Skin and skull. Adult male. Tanjong Rengsam, island of Banka, east of Sumatra. May 20, 1904. Collected by Dr. W. L. Abbott. Original number 3241. Catalogued November 29, 1904.

Well-made skin in good condition; skull perfect.

Tupaia phæura Miller.

Proc. Acad. Nat. Sci. Phila., 1902, p. 157, June 11, 1902.

113148. Skin and skull. Adult male. Sinkep Island, Rhio-Linga Archipelago. September 4, 1901. Collected by Dr. W. L. Abbott. Original number 1275. Catalogued February 1, 1902.

Well-made skin in good condition; skull perfect.

Tupaia pulonis Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 56, November 6, 1903.

112449. Skin and skull. Adult female. Pulo Aor, off coast of Johore. June 7, 1901. Collected by Dr. W. L. Abbott. Original number 1023. Catalogued November 13, 1901.

Well-made skin in good condition; skull perfect.

Tupaia sirhassenensis Miller.

Proc. Wash. Acad. Sci., III, p. 133, March 26, 1901.

104712. Skin and skull. Adult male. Sirhassen Island, Natuna Islands. June 5, 1900. Collected by Dr. W. L. Abbott. Original number 442. Catalogued December 18, 1900.

Well-made skin in good condition; skull perfect.

Tupaia sordida Miller.

Proc. Wash. Acad. Sci., II, p. 231, August 20, 1900.

101747. Skin and skull. Adult male. Pulo Tioman, off south-east coast of Malay Peninsula. October 2, 1899. Collected by Dr. W. L. Abbott. Catalogued January 20, 1900.

Well-made skin in good condition; skull perfect.

Tupaia nicobarica surda Miller.

Proc. U. S. Nat. Mus., XXIV, No. 1269, p. 774, May 28, 1902.

111757. Skin and skull. Adult male. Little Nicobar, Nicobar Islands. March 1, 1901. Collected by Dr. W. L. Abbott. Original number 899. Catalogued August 12, 1902.

Well-made skin in good condition; skull perfect.

Tupaia tephura Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 57, November 6, 1903.

121752. Skin and skull. Adult female. Tana Bala, Batu Islands, off west coast of Sumatra. February 12, 1903. Collected by Dr. W. L. Abbott. Original number 2276. Catalogued August 1, 1903.

Well-made skin in good condition; skull perfect.

Genus UROGALE.

Urogale cylindrura Mearns.

Proc. U. S. Nat. Mus., XXVIII, No. 1402, p. 435, May 13, 1905.

125387. Skin and skull. Adult male. Mount Apo, at the Bagobo village of Todaya (altitude 4,000 feet), southern Mindanao, Philip-

pine Islands. July 12, 1904. Collected by Dr. E. A. Mearns, U. S. A. Original number 5727. Catalogued December 13, 1904.

Well-made skin in good condition; skull perfect, except loss of left m_2.

Order DERMOPTERA.

Family GALEOPTERIDÆ.

Genus GALEOPTERUS

Galeopithecus aoris Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 47, November 6, 1903.
=Galeopterus aoris (Miller).

112428. Skin and skull. Adult female. Pulo Aor, off coast of Johore. June 8, 1901. Collected by Dr. W. L. Abbott. Original number 1028. Catalogued November 12, 1901.

Well-made skin in good condition; skull perfect.

Galeopithecus gracilis Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 49, pl. 6, fig. 2, November 6, 1903.
=Galeopterus gracilis (Miller).

104601. Skin and skull. Adult female. Sirhassen Island, Natuna Islands. June 7, 1900. Collected by Dr. W. L. Abbott. Original number 461. Catalogued December 15, 1900.

Well-made skin in good condition; skull perfect.

Galeopithecus natunæ Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 50, November 6, 1906.
=Galeopterus natunæ (Miller).

104602. Skin and skull. Adult female. Bunguran, Natuna Islands. July 16, 1900. Collected by Dr. W. L. Abbott. Original number 573. Catalogued December 15, 1900.

Well-made skin in good condition; skull perfect.

Galeopithecus pumilus Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 46, pl. 6, fig. 3, November 6, 1903.
=Galeopterus pumilus (Miller).

104448. Skin and skull. Adult male. Pulo Adang, Butang Islands, off west coast of Malay Peninsula. December 17, 1899. Collected by Dr. W. L. Abbott. Original number 165. Catalogued November 7, 1900.

Well-made skin in good condition; skull perfect.

Galeopithecus saturatus Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 51, pl. 7, figs. 3 and 4; pl. 8, figs. 3 and 4; pl. 9, figs. 3 and 4, November 6, 1903.

=**Galeopterus saturatus** (Miller).

121750. Skin and skull. Adult female. Tana Bala, Batu Islands, off west coast of Sumatra. February 12, 1903. Collected by Dr. W. L. Abbott. Original number 2278. Catalogued August 1, 1903.

Well-made skin in good condition; skull perfect.

Galeopithecus tuancus Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 53, November 6, 1903.

=**Galeopterus tuancus** (Miller).

114375. Skin and skull. Adult female. Pulo Tuanku, Banjak Islands, west coast of Sumatra. January 22, 1902. Collected by Dr. W. L. Abbott. Original number 1454. Catalogued August 28, 1902.

Well-made skin in good condition; skull perfect.

Order CHIROPTERA.

Family PTEROPIDÆ.

Genus CYNOPTERUS.

Cynopterus angulatus Miller.

Proc. Acad. Nat. Sci. Phila., 1898, p. 316, July 25, 1898.

83569. In alcohol, skull not removed. Adult male. Trong (or Tarang), lower Siam. 1896. Collected by Dr. W. L. Abbott. Catalogued April 28, 1897.

Condition good.

Cynopterus major Miller.

Proc. Biol. Soc. Wash., XIX, p. 62, May 1, 1906.

141236. Skin and skull. Adult male. Mojeia River, Nias Island, off west coast of Sumatra. March 11, 1905. Collected by Dr. W. L. Abbott. Original number 4021. Catalogued July 21, 1905.

Well-made skin in good condition; skull perfect.

Cynopterus minutus Miller.

Proc. Biol. Soc. Wash., XIX, p. 63, May 1, 1906.

141240. Skin and skull. Adult male. Nias Island, off west coast of Sumatra. March 11, 1905. Collected by Dr. W. L. Abbott. Original number 4043. Catalogued July 21, 1905.

Well-made skin in good condition; skull perfect.

Cynopterus pagensis Miller.

Proc. Biol. Soc. Wash., XIX, p. 62, May, 1, 1906.

121581. Skin and skull. Adult female. North Pagi Island, off west coast of Sumatra. November 12, 1902. Collected by Dr. W. L. Abbott. Original number 2028. Catalogued July 30, 1903.

Well-made skin in good condition; skull perfect, except loss of right premaxilla.

Genus NIADIUS.

Cynopterus princeps Miller.

Proc. Biol. Soc. Wash., XIX, p. 61, May 1, 1906.

=Niadius princeps (Miller). See Miller, Proc. Biol. Soc. Wash., XIX, p. 83, June 4, 1906.

141235. Skin and skull. Adult female. Mojeia River, Nias Island, off west coast of Sumatra. March 10, 1905. Collected by Dr. W. L. Abbott. Original number 4020. Catalogued July 21, 1905.

Well-made skin in good condition, except a bare spot over left thigh; skull perfect.

Genus PTEROPUS.

Pteropus aldabrensis True. Cotypes.

Description of a new species of Fruit Bat, *Pteropus aldabrensis*, from Aldabra Island, p. 1, July 14, 1893. Reprinted in Proc. U. S. Nat. Mus., XVI, No. 948, p. 533, October 21, 1893.

$\frac{20984}{36053}$ and $\frac{20985}{36054}$. Skins and skulls. Adult males. Aldabra Island, northwest of Madagascar. September 26 and October 5, 1892. Collected by Dr. W. L. Abbott. Catalogued June 30, 1893.

Well-made skins in good condition, except proximal extremities of bones of forearm have been cut off, so that measurements of the forearm can not be obtained; skulls perfect.

No type is specified in the original description, but these two specimens are mentioned by number and are here regarded as cotypes.

Pteropus baveanus Miller.

Proc. Biol. Soc. Wash., XIX, p. 63, May 1, 1906.

125482. Skin and skull. Adult male. Bawean Island, Java Sea. July 19, 1904. Collected by W. Grasshoff. Original number 16. Catalogued March 20, 1905.

Well-made skin in good condition; skull perfect, except for loss of two last upper molars and both tympanic rings.

Pteropus cagayanus Mearns.

Proc. U. S. Nat. Mus., XXVIII, No. 1402, p. 433, May 13, 1905.

125289. Skin and skull. Adult male. Cagayan Sulu Island, near west side of the Sulu Sea, Philippine Islands. February 25, 1904. Col-

lected by Dr. E. A. Mearns, U. S. A. Original number 5755. Catalogued December 13, 1904.

Well-made skin in good condition; skull perfect, except for loss of tympanics and left upper canine.

Pteropus enganus Miller.

Proc. U. S. Nat. Mus., XXX, No. 1472, p. 822, June 4, 1906.

140966. Skin and skull. Adult male. Pulo Dua, Engano Island, west of Sumatra. November 4, 1904. Collected by Dr. W. L. Abbott. Original number 3774. Catalogued July 17, 1905.

Well-made skin in good condition; skull perfect.

Pteropus faunulus Miller.

Proc. U. S. Nat. Mus., XXIV, No. 1269, p. 785, May 28, 1902.

111730. Skin and skull. Adult male. Car Nicobar, Nicobar Islands. January 23, 1901. Collected by Dr. W. L. Abbott. Original number 864. Catalogued August 12, 1901.

Well-made skin in good condition; skull much damaged by shot, but glued together so that practically only the anterior half of the right zygoma is missing.

Pteropus geminorum Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 60, November 6, 1903.

104464. Skin and skull. Adult female. South Twin Island, Mergui Archipelago. January 28, 1900. Collected by Dr. W. L. Abbott. Original number 283. Catalogued November 7, 1900.

Well-made skin in good condition; skull perfect, except for loss of tympanic rings.

Pteropus lanensis Mearns.

Proc. U. S. Nat. Mus., XXVIII, No. 1402, p. 432, May 13, 1905.

123291. Skin and skull. Adult male. Pantar, near Lake Lanao (altitude, 1,907 feet), Mindanao, Philippine Islands. September 7, 1903. Collected by Dr. E. A. Mearns, U. S. A. Original number 5626. Catalogued January 28, 1904.

Well-made skin in good condition; skull perfect, except loss of tympanics, left m^3, left pm_4, and m_3.

Pteropus lanigera H. Allen.

Proc. Amer. Phil. Soc., XXVIII, p. 70, May 10, 1890.

=Pteropus insularis Hombron and Jacquinot. See Matschie, Flederm. des Berliner Mus. für Naturk., p. 28, 1899.

$\frac{19066}{37815}$. Skin and skull. Said to be from the Samoan Islands, but this locality is undoubtedly incorrect. Purchased from Ward's Natural Science Establishment, Rochester, N. Y., bearing No. 4397. Catalogued August 21, 1890; skull, November 14, 1899.

Well-made skin (remade and skull removed in November, 1899) in good condition. Skull somewhat broken about the foramen magnum; two teeth are missing from the mandible.

Dr. H. Allen fails to specify the type by number, but speaks of only one specimen in his description, and that as being in Ward's Natural Science Establishment. The specimen was purchased from Ward's in August, 1890, shortly after Doctor Allen's description appeared. On the original label is written "Pteropus *lanigera sp. nov.* Samoa Is.," the italicized part being in Dr. H. Allen's handwriting.

Pteropus lepidus Miller.

Proc. Wash. Acad. Sci., II, p. 237, fig. 16, August 20, 1900.

101670. Skin and skull. Adult female. Kaju Ara, or Saddle Island, Tambelan Islands, South China Sea. August 15, 1899. Collected by Dr. W. L. Abbott. Catalogued January 19, 1900.

Well-made skin in good condition; skull perfect.

Pteropus niadicus Miller.

Proc. Biol. Soc. Wash., XIX, p. 64, May 1, 1906.

141233. Skin and skull. Adult male. Teliwaa, Nias Island, off west coast of Sumatra. March 5, 1905. Collected by Dr. W. L. Abbott. Original number 3981. Catalogued July 21, 1905.

Well-made skin in good condition; skull perfect, except loss of tympanic rings.

Pteropus samoensis Peale. Cotypes.

U. S. Exploring Expedition, VIII, Mammalia and Ornithology, p. 20, 1848.

This species is based upon material brought back by the U. S. Exploring Expedition. No type is designated, and there is nothing to show that one specimen is more typical than any other. It is inconvenient to regard all the Samoan *Pteropus* brought back by the Expedition as cotypes. Those specimens from Tutuila are here regarded as the cotypes of the species, the following quotation from the original description seeming to justify this selection: "This species was first discovered on the island of Tutuila, and subsequently on all the islands of the Samoan group; we obtained numerous specimens."

The specimens from Tutuila are as follows:

$\frac{8594}{25562}$. Collected by James Gibson. The catalogue, under remarks, says: "Specimen turned over to Dept. Comp. Anat. for exhibition." Only the skull can now be found. It has the posterior part of brain-case cut away. Skin catalogued July 30, 1866; skull, February 7, 1887.

$\frac{8596}{37862}$. Female. Original number 14. Recently made into a modern study skin in fair condition and skull removed. Posterior part of brain-case cut away, all molars of upper left hand side broken away, otherwise skull in good condition. Skin catalogued July 30, 1866; skull, February 21, 1900.

$\frac{8597}{37860}$. Collected by W. Elliott. Recently made into a modern study skin, in fair condition, and skull removed. Skull nearly perfect,

both tympanic bones and posterior half of right zygoma missing; right half of mandible broken into two portions. Skin catalogued July 30, 1866; skull, February 26, 1900.

Pteropus vociferus Peale.

U. S. Exploring Expedition, VIII, Mammalia and Ornithology, p. 19, 1848.

3961. Skin. Adult male. Island of Mangsi, straits of Balabac. Collected by U. S. Exploring Expedition (1838–1842). Original number 7. Catalogued May 31, 1860.

Specimen once mounted and on exhibition, then packed away in storage, but taken out March 31, 1902. It is in fair condition for an old specimen, evidently bleached. It had no skull inside, nor is there any record of one.

Peale speaks of but one specimen, a male, and unquestionably it is No. 3961, catalogued as *Pteropus macklotii* Temminck from Mangsi.

Family EMBALLONURIDÆ.

Genus EMBALLONURA.

Emballonura anambensis Miller.

Proc. Wash. Acad. Sci., II, p. 236, fig. 15, August 20, 1900.

101716. In alcohol (skull removed). Adult female. Pulo Mobur, Anamba Islands, South China Sea. August 26, 1899. Collected by Dr. W. L. Abbott. Catalogued January 20, 1900.

Alcoholic in good condition; skull perfect.

Emballonura peninsularis Miller.

Proc. Acad. Nat. Sci. Phila., 1898, p. 323, July 12, 1898.

83575. In alcohol (skull removed). Adult male. Trong (or Tarang), lower Siam. November, 1896. Collected by Dr. W. L. Abbott. Catalogued April 28, 1897.

Posterior portion of the brain-case largely broken away; skull otherwise complete; alcoholic in good condition.

Vespertilio semicaudatus Peale.

U. S. Exploring Expedition, VIII, Mammalia and Ornithology, p. 23, 1848.

=**Emballonura semicaudata** (Peale). See Wagner, Suppl. Schreber's Saügeth., V, p. 698, 1855.

3727. Mummy, dried from alcohol. No skull. Samoan Islands. Collected by the U. S. Exploring Expedition, 1838–'42. Catalogued December 20, 1859.

Skin with wings spread and wing-membranes torn in places. Skin of head badly torn and mutilated, probably due to a clumsy extraction of the skull, which has been lost. Right ear missing.

There is very little doubt that the above is the type. The description is based upon a single specimen collected by the U. S. Exploring Expedition from the Samoan Islands.

Family MEGADERMIDÆ.

Genus MEGADERMA.

Megaderma carimatæ Miller.

Proc. U. S. Nat. Mus., XXXI, No. 1481, p. 63, July 23, 1906.

125185. In alcohol (skull removed). Adult female. Tanjong Karimata Tua, Karimata Island, off west coast of Borneo. August 31, 1904. Collected by Dr. W. L. Abbott. Original number 3709. Catalogued December 9, 1904.

Alcoholic in good condition; skull perfect.

Genus LAVIA.

Lavia rex Miller.

Proc. Biol. Soc. Wash., XVIII, p. 227, December 9, 1905.
=**Lavia frons frons** (Geoffroy). See Andersen and Wroughton, Ann. Mag. Nat. Hist. (7th ser.), XIX, p. 139, February, 1907.

$\frac{18993}{38157}$. In alcohol (skull removed). Adult male. Taveta, German East Africa. 1889. Collected by Dr. W. L. Abbott. Alcoholic catalogued June 24, 1890; skull, February 18, 1904.

Alcoholic in good condition; skull badly broken, mandible and rostrum perfect, and three fragments of brain-case present.

Family RHINOLOPHIDÆ.

Genus RHINOLOPHUS.

Rhinolophus circe Andersen.[a]

Proc. U. S. Nat. Mus., XXIX, No. 1440, p. 657, March 7, 1906.

141343. In alcohol. Adult male. Pulo Nias, off west coast of Sumatra. March 15, 1905. Collected by Dr. W. L. Abbott. Original number 4094. Catalogued July 24, 1905.

Rhinolophus hirsutus Andersen.[a]

Ann. Mag. Nat. Hist. (7th ser.), XVI, p. 289, September, 1905.

105487. In alcohol. Adult female. Guimarás Island, Philippine Islands. December, 1887. Collected by Prof. J. B. Steere. Catalogued May 14, 1901.

Rhinolophus inops Andersen.[a]

Ann. Mag. Nat. Hist. (7th ser.), XVI, p. 284, September, 1905.

125314. In alcohol (skull removed). Adult male. Todaya, Mount Apo (4,000 feet), southern Mindanao, Philippine Islands. July 8, 1904. Collected by Dr. E. A. Mearns, U. S. A. Original number 5713. Catalogued December 13, 1904.

---

[a] See footnote, page VIII.

Rhinolophus minutus Miller.

Proc. Wash. Acad. Sci., II, p. 235, August 20, 1900. Preoccupied by *Vespertilio minutus* Montagu. Applied to the British race of *Rhinolophus hipposideros*. (See Andersen, Proc. Zool. Soc. London, 1905, II, p. 129.)

=**Rhinolophus minutillus** Miller. See Proc. Biol. Soc. Wash., XIX, p. 41, February 26, 1906.

101715. In alcohol (skull removed). Adult male. Pulo Siantan, Anamba Islands, South China Sea. September, 1899. Collected by Dr. W. L. Abbott. Catalogued January 19, 1900.

Alcoholic in good condition; skull in good condition, except posterior portion of brain-case much broken, represented by a few small fragments.

Rhinolophus nereis Andersen.[a]

Proc. Zool. Soc. London, 1905, II, p. 90, October 17, 1905.

101714. In alcohol (skull removed). Adult female. Pulo Siantan, Anamba Islands, South China Sea. September, 1899. Collected by Dr. W. L. Abbott. Catalogued January 20, 1900.

Rhinolophus affinis nesites Andersen.[a]

Proc. Zool. Soc. London, 1905, II, p. 104, October 17, 1905.

104753. In alcohol. Adult female. Bunguran, Natuna Islands. July 24, 1900. Collected by Dr. W. L. Abbott. Catalogued December 18, 1900.

Rhinolophus trifoliatus niasensis Andersen.[a]

Proc. U. S. Nat. Mus., XXIX, No. 1440, p. 658, March 7, 1906.

141350. In alcohol. Adult male. Pulo Nias, off west coast of Sumatra. March 15, 1905. Collected by Dr. W. L. Abbott. Original number 4088. Catalogued July 24, 1905.

Rhinolophus solitarius Andersen.[a]

Ann. Mag. Nat. Hist. (7th ser.), XVI, p. 250, August, 1905.

124767. In alcohol (skull removed). Adult male. Tanjong Pamuja, island of Banka, between Sumatra and Borneo. June 18, 1904. Collected by Dr. W. L. Abbott. Original number 3415. Catalogued December 2, 1904.

Rhinolophus spadix Miller.

Proc. Wash. Acad. Sci., III, p. 136, March 26, 1901.

104752. In alcohol (skull removed). Adult female. Sirhassen Island, Natuna Islands. June 5, 1900. Collected by Dr. W. L. Abbott. Catalogued December 18, 1900.

Alcoholic in good condition, right forearm broken; skull perfect.

Rhinolophus virgo Andersen.[a]

Proc. Zool. Soc. London, 1905, II, p. 88, October 17, 1905.

101966. In alcohol. Adult female. Southern coast of Luzon, province of South Camarines, Philippine Islands. 1899–1900. Collected by L. M. McCormick. Catalogued February 19, 1900.

---

[a] See footnote page VIII.

Family HIPPOSIDERIDÆ.

Genus HIPPOSIDEROS.

Hipposideros barbensis Miller.

Proc. Wash. Acad. Sci., II, p. 233, August 20, 1900.

101625. Skin and skull. Adult male. Ste. Barbe Island, South China Sea. August 1, 1899. Collected by Dr. W. L. Abbott. Catalogued January 19, 1900.

Well-made skin in good condition; skull perfect, except posterior portion somewhat broken.

Hipposideros nicobarulæ Miller.

Proc. U. S. Nat. Mus., XXIV, No. 1269, p. 781, May 28, 1902.

111874. In alcohol (skull removed). Adult male. Little Nicobar, Nicobar Islands. March 2, 1901. Collected by Dr. W. L. Abbott. Catalogued August 17, 1901.

Alcholic in good condition; skull perfect.

Family PHYLLOSTOMIDÆ.

Genus CHILONYCTERIS.

Chilonycteris mexicana Miller. Biological Survey collection.

Proc. Acad. Nat. Sci. Phila., 1902, pp. 401–403, September 12, 1902.

=**Chilonycteris rubiginosa mexicana** (Miller). See Rehn, Proc. Acad. Nat. Sci. Phila., 1904, p. 203, March 29, 1904.

89277. Skin and skull. Adult male. San Blas, Tepic, Mexico. June 9, 1897. Collected by E. W. Nelson and E. A. Goldman. Original number 11132.

Well-made skin in good condition; skull perfect.

Chilonycteris portoricensis Miller.

Proc. Acad. Nat. Sci. Phila., 1902, p. 400, September 12, 1902.

102358. Skin and skull. Adult female. Cave near Pueblo Viejo, Porto Rico, West Indies. March 19, 1900. Collected by Drs. L. Stejneger and C. W. Richmond. Original number "G." Catalogued June 2, 1900.

Well-made skin in good condition; skull perfect, except for loss of right malar.

Genus MORMOOPS.

Mormoops intermedia Miller.

Proc. Biol. Soc. Wash., XIII, p. 160, October 31, 1900.

102174. In alcohol (skull not removed). Adult female. Cave at Hatto, on the north coast of Curaçao, West Indies. April 29, 1900. Collected by Leon J. Guthrie. Catalogued May 22, 1900.

Specimen is in "brown phase" and in fairly good condition; skin broken on the back over lumbar vertebræ; skull not removed.

Mormoops megalophylla senicula Rehn.

Proc. Acad. Nat. Sci. Phila., 1902, p. 169, June 11, 1902.

84801. Skin and skull. Adult female. Fort Clark, Kinney County, Texas. December 3, 1897. Collected by Dr. E. A. Mearns, U. S. A. Original number 4273. Catalogued August 23, 1898.

Well-made skin in good condition; skull perfect.

Genus MICRONYCTERIS.

Micronycteris megalotis mexicanus Miller. Biological Survey coll.

Proc. Acad. Nat. Sci. Phila., 1898, pp. 329–330, July 27, 1898.

52105. In alcohol (skull not removed). Adult female. Plantinar, Jalisco, Mexico. April 4, 1892. Collected by E. W. Nelson. Original number 2389.

Specimen in good condition; skull not removed.

Micronycteris microtis Miller.

Proc. Acad. Nat. Sci. Phila., 1898, p. 328, July 12, 1898.

$\frac{16366}{23364}$. Skin and skull. Adult male. Greytown, Nicaragua. Collected by Dr. L. F. H. Birt. Catalogued February 2, 1889, as an alcoholic; skull catalogued April 16, 1889. There is no record showing at what time the alcoholic was made into a skin.

Wing membranes considerably torn, but skin otherwise in good condition (see Lyon, Ann. Mag. Nat. Hist., ser. 7th, XVIII, November, 1906, p. 371); skull perfect.

Genus OTOPTERUS.

Macrotus californicus Baird. See page 290.

Genus TONATIA.

Lophostoma venezuelæ Robinson and Lyon.

Proc. U. S. Nat. Mus., XXIV, No. 1246, p. 154, October 3, 1901.

=**Tonatia venezuelæ** (Robinson and Lyon). See Lyon, Proc. Biol. Soc. Wash., XV, p. 248, December 16, 1902.

102919. In alcohol (skull removed). Adult female. Macuto, 8 miles east of La Guaira, Venezuela. August 4, 1900. Collected by Dr. M. W. Lyon, jr., and Major Wirt Robinson, U. S. A. Original number 199. Catalogued September 24, 1900.

Alcoholic in good condition, except for a small bare patch on back; skull perfect.

Genus GLOSSOPHAGA.

Glossophaga elongata Miller.

Proc. Biol. Soc. Wash., XIII, p. 124, April 6, 1900.

101871. Skin and skull. Adult female. Willemstad, Curaçao, West Indies. December 4, 1899. Collected by Leon J. Guthrie. Catalogued January 31, 1900.

The specimen was originally preserved in formalin, but on February 27, 1900, was made into a study skin, in good condition; skull perfect.

[illegible] collection.

[illegible] Island. Tre- [illegible] E. W.

[illegible]

[illegible] original [illegible] corresponds [illegible] in the origi- [illegible] No other [illegible] February 12, [illegible] H. Allen in his [illegible] is probably [illegible] made by his [illegible] where [illegible] be taken [illegible] the writ- [illegible] the locality [illegible] of Venezuela bor- [illegible] or whether it [illegible] region of Vene- [illegible] specimen which [illegible] and it may or [illegible]

[illegible]

GENUS MONOPHYLLUS.

Monophyllus clinedaphus Miller.

[illegible]

[illegible] Specimen with no [illegible] skull May 2, 1898.

[illegible] missing and right con- [illegible]

Monophyllus cubanus Miller.

Proc. [illegible] Phila. 1902, p. [illegible], September 12, 1902.

113674 [illegible] and skull. Adult male. Baracoa, eastern Cuba. West Indies. February 6, 1902. Collected by William Palmer. Original number 61[illegible]. Catalogued April 17, 1902.

[illegible] skin in good condition: skull perfect, except slight break in left

4

Monophyllus luciæ Miller.

Proc. Acad. Nat. Sci. Phila., 1902, p. 411, September 12, 1902.

106095. In alcohol (skull removed). Adult male. Santa Lucia Island, West Indies. February 4, 1901. Collected by H. Selwyn Branch. Catalogued June 25, 1901.

Alcoholic in good condition; skull perfect.

Monophyllus plethodon Miller.

Proc. Wash. Acad. Sci., II, p. 35, March 30, 1900.

101530. In alcohol (skull removed). Adult male. St. Michael's Parish, Barbados, West Indies. August, 1899. Collected by P. McDonough. Catalogued January 2, 1900.

Alcoholic in good condition; skull somewhat injured, both zygomata incomplete, bullæ detached, but present.

Monophyllus portoricensis Miller.

Proc. Wash. Acad. Sci., II, p. 34, March 30, 1900.

86261. In alcohol (skull removed). Adult male. Cave near Bayamon, Porto Rico. January 18, 1899. Collected by Paul Beckwith. Catalogued March 16, 1899.

Alcoholic in good condition; skull perfect.

Genus LEPTONYCTERIS.

Leptonycteris curasoæ Miller.

Proc. Biol. Soc. Wash., XIII, p. 126, April 6, 1900.

101851. In alcohol (skull removed). Adult male. Willemstad, Curaçao, West Indies. November to December, 1899. Collected by Leon J. Guthrie. Catalogued January 31, 1900.

Considerable hair has sloughed from alcoholic and viscera are soft; skull perfect.

Genus HEMIDERMA.

Carollia castanea H. Allen.

Proc. Amer. Phil. Soc., XXVIII, p. 19, February 25, 1890.

=**Hemiderma castaneum** (H. Allen). See Miller and Rehn, Proc. Bost. Soc. Nat. Hist., XXX, p. 283, December 27, 1901.

$\frac{12914}{36384}$. In alcohol (skull removed). Adult male. Costa Rica. Probably 1876. Collected by José C. Zeledon. Alcoholic catalogued June 23, 1878; skull, November 11, 1893.

Alcoholic in good condition; skull perfect.

Hemiderma subrufum Hahn. Biological Survey collection.

Proc. Biol. Soc. Wash., XVIII, pp. 247–248, December 9, 1905.

75127. Skin and skull. Adult male. Santa Ifigenia, Oaxaca, Mexico. July 29, 1895. Collected by E. W. Nelson and E. A. Goldman. Original number 8235.

Well-made skin in good condition; skull perfect, except for broken zygomata.

Hemiderma tricolor Miller.

Proc. Acad. Nat. Sci. Phila., 1902, p. 408, September 12, 1902.
=**Hemiderma perspicillatum** (Linnæus). See Hahn, Proc. U. S. Nat. Mus., XXXII, No. 1514, p. 108, February 9, 1907.

114005. Skin and skull. Adult female. Cave at Sapucay, Paraguay. December 5, 1901. Collected by William T. Foster. Original number 589. Catalogued May 10, 1902.

Well-made skin in good condition; skull perfect.

Genus BRACHYPHYLLA.

Brachyphylla nana Miller.

Proc. Acad. Nat. Sci. Phila., 1902, p. 409, September 12, 1902.

103828. Skull. Adult. Taken from pellets of Cuban Barn Owl, El Guama, Cuba. March 10, 1900. Collected by William Palmer and J. H. Riley. Original number 108. Catalogued October 13, 1900.

No lower jaw present; all the teeth missing except the first molar on each side; posterior right-hand part of brain-case broken away.

Genus URODERMA.

Uroderma convexum Lyon.

Proc. Biol. Soc. Wash., XV, p. 83, April 25, 1902.

111722. In alcohol (skull removed). Young adult female. Colon, Panama. May 28, 1901. Collected by J. W. Humphreys. Catalogued July 30, 1901.

Alcoholic in good condition, but rather shrunken from action of formalin and subsequent drying; skull somewhat damaged about the foramen magnum, especially to the right of it.

Genus VAMPYROPS.

Vampyrops fumosus Miller.

Proc. Acad. Nat. Sci. Phila., 1902, p. 405, September 12, 1902.

105530. Skin and skull. Adult female. Hyutanaham, Purus River, Brazil. March 24, 1901. Collected by Prof. J. B. Steere. Original number 83. Catalogued May 15, 1901.

Well-made skin in good condition; most of the skull posterior to the roots of the zygomata broken away, anterior parts perfect.

Genus ECTOPHYLLA.

Ectophylla alba H. Allen.

Proc. U. S. Nat. Mus., XV, No. 913, p. 442, October 26, 1892.

15950. Skin (without skull) preserved in alcohol. Segovia River, eastern Honduras. July 1, 1887. Collected by C. H. Townsend. Original number 313. Catalogued November 10, 1887.

Specimen in good condition except for some mutilation about the lower lip.

No type designated. Dr. H. Allen had but one specimen, readily seen to be the above from his opening paragraph, where he speaks of its condition, locality, etc. He says, "believed to be from the vicinity of the Segovia River, eastern Honduras." A note from Mr. C. H. Townsend of February 1, 1902, who has referred to No. 313 in his catalogue, writes, "No. 313 (bat) was killed July 1/88 on Segovia R." Evidently a slip of the pen for '87, as the specimen was catalogued November 10, 1887.

Genus ARTIBEUS.

Artibeus aztecus Andersen.[a] Biological Survey collection.

Ann. Mag. Nat. Hist., 7th ser., XVIII, p. 422, December, 1906.

52050. Skin and skull. Adult male. Tetela del Volcan, Morelos, Mexico. February 12, 1893. Collected by E. W. Nelson.

Artibeus hirsutus Andersen.[a] Biological Survey collection.

Ann. Mag. Nat. Hist., 7th ser., XVIII, pp. 420–421, December, 1906.

126449. Skin and skull. Adult male. La Salada, Michoacan, Mexico. May 22, 1908. Collected by E. W. Nelson and E. A. Goldman. Original number 16168.

Dermanura phæotis Miller. Biological Survey collection.

Proc. Acad. Nat. Sci. Phila., 1902, p. 405, September 12, 1902.

=**Artibeus phæotis** (Miller). See Miller, Bull. U. S. Nat. Mus., No. 57, p. 161, June 29, 1907.

108176. Skin and skull. Adult female. Chichenitza, Yucatan, Mexico. February 10, 1901. Collected by E. W. Nelson and E. A. Goldman. Original number 14537.

Well-made skin, with epidermis about joints of wings and feet damaged by insects; skull perfect.

Artibeus jamaicensis præceps Andersen.[a]

Ann. Mag. Nat. Hist., 7th ser., XVIII, p. 421, December, 1906.

113503. In alcohol. Adult male. Guadeloupe, West Indies. January 22, 1902. Collected by H. Selwyn Branch. Catalogued April 12, 1902.

Dermanura rava Miller.

Proc. Acad. Nat. Sci. Phila., 1902, p. 404, September 12, 1902.

=**Artibeus ravus** (Miller). See Miller, Bull. U. S. Nat. Mus., No. 57, p. 162, June 29, 1907.

113338. Skin and skull. Adult male. San Javier, northern Ecuador. August 10, 1900. Collected by G. Flemming. Original number 12. Catalogued March 3, 1902.

Well-made skin in good condition; skull perfect.

---

[a] See footnote, page VIII.

Genus ARDOPS.

[illegible] Miller.

[illegible] p. 4[illegible], September 12, 1902.
=[illegible] Miller. [illegible] Wash., XIX, p. 84, [illegible]

[illegible] Adult female. Santa Lucia [illegible] February [illegible] Collected by H. Selwyn [illegible]

[illegible]

Genus CENTURIO.

Centurio [illegible] H. Allen.

[illegible] published November 26, 1861.
=Centurio [illegible] Nat. Sci. Phila., 1901, p. 297, [illegible]

[illegible] Adult male. Mirador, Vera Cruz, Mexico. [illegible] Dr. C. Sartorius. Catalogued in [illegible] November [illegible]

[illegible]
Type [illegible]

Genus EROPHYLLA.

Phyllonycteris bombifrons Miller.

Proc. Biol. Soc. Wash., XIII, p. 35, May 29, 1899.
=Erophylla bombifrons (Miller). See Miller, Proc. Biol. Soc. Wash., XIX, p. 84, June 4, 1906.

86274. In alcohol (skull removed). Adult male. In a limestone cave near Bayamon, San Juan Province, Porto Rico, West Indies. January 18, 1899. Collected by Paul Beckwith. Catalogued March 16, 1899.

Alcoholic in good condition; skull perfect.

Phyllonycteris planifrons Miller.

Proc. Biol. Soc. Wash., XIII, p. 34, May 29, 1899.
=Erophylla planifrons (Miller). See Miller, Proc. Biol. Soc. Wash., XIX, p. 84, June 4, 1906.

62517. In alcohol (skull removed). Adult male. Nassau, New Providence, Bahama Islands. March 18, 1886. Collected by Dr. James E. Benedict. Catalogued July 13, 1895.

Alcoholic in good condition; skull perfect.

Family NATALIDÆ.

Genus NATALUS.

Natalus major Miller.

Proc. Acad. Nat. Sci. Phila., 1902, p. 398, September 12, 1902.

101395. In alcohol (skull removed). Adult male. Savaneta, Santo Domingo, West Indies. Collected by Prof. W. M. Gabb. Catalogued November 3, 1899. Received in exchange from Academy of Natural Sciences of Philadelphia.

Alcoholic in good condition; skull perfect.

Natalus mexicanus Miller. Biological Survey collection.

Proc. Acad. Nat. Sci. Phila., 1902, pp. 399–400, September 12, 1902.

96496. In alcohol (skull removed). Adult female. Santa Anita, Lower California, Mexico. July or August, 1897. Collected by J. F. Abbott. Original number 1953x.

Specimen in good condition; skull perfect, except for slightly fractured braincase.

Genus PHODOTES.

Natalus tumidirostris Miller.

Proc. Biol. Soc. Wash., XIII, p. 160, October 31, 1900.

=Phodotes tumidirostris (Miller). See Miller, Proc. Biol. Soc. Wash., XIX, p. 85, June 4, 1906.

102106. In alcohol (skull removed). Adult male. In a cave at Hatto, north side of Curaçao, West Indies. May 1, 1900. Collected by Leon J. Guthrie. Catalogued May 22, 1900.

Alcoholic in good condition; skull perfect, except right tympanic bone missing.

Genus CHILONATALUS.

Natalus (Chilonatalus) brevimanus Miller.

Proc. Acad. Nat. Sci. Phila., 1898, p. 328, July 12, 1898.

=Chilonatalus brevimanus (Miller). See Miller, Proc. Biol. Soc. Wash., XVI, p. 119, September 30, 1903.

15835. In alcohol (skull not removed). Adult male. Old Providence Island, Caribbean Sea. Collected by C. B. Cory. Catalogued May 25, 1887.

Specimen in good condition; skull not taken out.

Chilonatalus tumidifrons Miller.

Proc. Biol Soc. Wash., XVI, p. 119, September 30, 1903.

122024. In alcohol (skull removed). Adult male. Watling Island, Bahama Islands. July 12, 1903. Collected by J. H. Riley. Original number 157. Catalogued August 19, 1903.

Alcoholic in good condition; skull perfect.

Family VESPERTILIONIDÆ.

Genus MYOTIS.

Vespertilio affinis H. Allen.

Monograph Bats of North America, Smithsonian Miscell. Coll., No. 165, p. 53, June, 1864.

=**Myotis lucifugus** (Le Conte). See Miller, North Amer. Fauna, No. 13, p. 20, October 16, 1897.

5342. In alcohol (skull removed and lost). Adult female. Fort Smith, Arkansas. Collected by Dr. G. G. Shumard. Catalogued October 30, 1861.

Specimen in fair condition; all the hair of belly and lower back has slipped off; skull lost.

Species based on one specimen, the above, designated by number.

Myotis lucifugus alascensis Miller. Biological Survey collection.

North Amer. Fauna, No. 13, pp. 63–64, fig. 13*d*, October 16, 1897.

77416. In alcohol (skull not removed). Adult female. Sitka, Alaska. August 5, 1895. Collected by C. P. Streator. Original number 4754.

Specimen in good condition; skull not removed.

Myotis carimatæ Miller.

Proc. U. S. Nat. Mus., XXXI, No. 1481, p. 62, July 23, 1906.

125154. In alcohol (skull removed). Adult female. Telok Edar, Karimata Island, off west coast of Borneo, August 28, 1904. Collected by Dr. W. L. Abbott. Original number 3673. Catalogued December 9, 1904.

Alcoholic in good condition; skull perfect.

Myotis californicus caurinus Miller. Biological survey collection.

North Amer. Fauna, No. 13, p. 72, October 16, 1897.

72219. In alcohol (skull not removed). Adult male. Massett, Graham Island, Queen Charlotte Islands, British Columbia. 1895. Collected by Rev. J. H. Keen.

Specimen in good condition, except for slight injury to abdomen; skull not removed.

Myotis dominicensis Miller.

Proc. Biol. Soc. Wash., XV, p. 243, December 16, 1902.

113564. In alcohol (skull removed). Adult male. Dominica, West Indies. July 20, 1901. Collected by H. Selwyn Branch. Catalogued April 12, 1902.

Alcoholic in good condition; skull perfect.

Vespertilio subulatus keenii Merriam. Biological Survey collection.

Amer. Nat., XXIX, pp. 860–861, September 1, 1895.

=**Myotis subulatus keenii** (Merriam). See Miller, North Amer. Fauna, No. 13, p. 77, October 16, 1897.

72922. In alcohol (skull not removed). Adult female. Massett, Graham Island, Queen Charlotte Islands, British Columbia. Summer, 1894. Collected by Rev. J. H. Keen.

Specimen in good condition; skull not removed.

Myotis longicrus True.

Science, VIII, p. 588, December 24, 1886.

=**Myotis lucifugus longicrus** (True). See Miller, North Amer. Fauna, No. 13, p. 64, October 16, 1897.

$\frac{15623}{23490}$. In alcohol (skull removed). Young adult female. Region of Puget Sound. Collected by Dr. D. S. Jordan. Catalogued December 16, 1886.

The hair has slipped off from the lower dorsal and ventral regions and the skin has been incised along the midventral line to permit removal of skull; skull perfect.

Type not designated by number. The description implies but a single specimen, unquestionably the above. The word "Type" is written in the "remarks" column of the catalogue.

Vespertilio macropus H. Allen.

Proc. Acad. Nat. Sci. Phila., 1866, p. 288, ordered published August 28, 1866.

=**Myotis yumanensis** (H. Allen). See Miller, North Amer. Fauna, No. 13, pp. 66 and 67, October 16, 1897.

84549. Skin without skull. Adult male. Colorado River, near Fort Mohave, Arizona. November 1, 1866. Collected by Dr. Elliott Coues. Catalogued April 21, 1898.

Specimen a flat skin with expanded wings and much of the membrane between the fingers broken out.

The specimen bears the following label: Private collection. Expl. in Rocky Mts. Dr. Elliott Coues U. S. A. [in print] *V. macropus.* Nov. TYPE [in what seems to be Dr. H. Allen's handwriting]. Near Fort Mojave, Colorado R., Nov. 1, 1866 [in what seems to be Doctor Coues's handwriting]." *Mojave* is so written that it resembles *Majaor* as given in the original description. The above label agrees in every respect with the data given by Dr. H. Allen in the original description of the single specimen that he had. It was found in the Museum collection unnumbered, and was catalogued as No. 84549, April 21, 1898.

Vespertilio melanorhinus Merriam. Biological Survey collection.

North Amer. Fauna, No. 3, pp. 46–47, September 4, 1890.

=**Myotis californicus** (Audubon and Bachman). See Miller, North Amer. Fauna, No. 13, p. 69, October 16, 1897.

18684. In alcohol (skull not removed). Adult male. San Francisco Mountain, Arizona. August 4, 1889. Collected by Dr. C. H. Merriam and V. Bailey. Original number 275.

Specimen in good condition; skull not removed.

Myotis nesopolus Miller.

Proc. Biol. Soc. Wash., XIII, p. [illegible], April [illegible], 1900.

101549. Skin and skull. Adult male. Punda, Curaçao, West Indies. November 4, 1899. Collected by Leon J. Guthrie. Catalogued January 31, 1900.

Specimen originally preserved entire in formalin, but made into a dry skin on February [illegible], 1900.

Well-made skin in good condition; skull perfect.

Vespertilio nitidus H. Allen.

Proc. Acad. Nat. Sci. Phila., 1862, p. 247, ordered published April 29, 1862.

=**Myotis californicus** (Audubon and Bachman). See Miller, North Amer. Fauna, No. 13, p. 69, October 16, 1897.

523/1654. Skin and skull. Adult. Fort Steilacoom, Puget Sound, Washington. Collected by Dr. George Suckley. "N. Pacific R. R. Survey, Gov. I. I. Stevens." First catalogued February 26, 1855; again catalogued October 31, 1861, as No. 5447.

The specimen is a skin almost falling to pieces, made up with wings expanded. Skull has lost right tympanic bone, most of right zygoma, and left half of mandible. Parts of occipital about foramen magnum have been broken away.

No type designated. A table of measurements accompanies the original description and five specimens are mentioned. Measurements of these five specimens are given in Allen's Monograph of Bats of North America, p. 61, 1865. There it is readily seen that the measurements given in the original description are not those of the average of the original five specimens, nor do they agree with those of any particular one, but they more nearly represent the measurements of No. 523 than they do any of the others. For that reason No. 523 is here regarded as the type. It may be contended, however, that 1981 being the first mentioned in the original description should be taken as the type; but No. 1981 apparently was an alcoholic and the original description is evidently based upon a skin and skull. Moreover, the greater number of the specimens, four, came from Fort Steilacoom, and these should be taken to represent the species better. Of the original five specimens, the type, No. 523, No. 522, a skin, and skulls, [illegible] and [illegible], seem to be the only ones extant.

Vespertilio obscurus H. Allen.

Proc. Acad. Nat. Sci. Phila., 1866, p. 281, ordered published August 26, 1866.

=**Myotis californicus** (Audubon and Bachman). See Miller, North Amer. Fauna, No. 13, p. 69, October 16, 1897.

8223. In alcohol (skull not removed). Adult male. Lower California, Mexico. Collected by John Xantus. Catalogued in 1865.

Left wing lacking entirely and only the bones of the right wing remaining. The rest of the specimen is in good condition.

Vespertilio oregonensis H. Allen. Cotypes.

Monograph Bats North America, Smithsonian Miscell. Coll., No. 165, p. 61, June, 1864.

=**Myotis californicus** (Audubon and Bachman). See Miller, North Amer. Fauna, No. 13, p. 69, October 16, 1897.

Four cotypes. See Miller, *loc cit.*, p. 33.

5402. Catalogued earlier as No. 4977. In alcohol. Male. Cape St. Lucas, Lower California, Mexico. Collected by John Xantus. Original number 3895. Catalogued May 31 and later October, 1861. Can not be found.

5405. In alcohol. Female. Fort Yuma, California. Collected by Maj. G. H. Thomas, U. S. A. Catalogued October 31, 1861. Specimen can not be found.

5537. In alcohol. Male. Fort Yuma, California. Collected by Maj. G. H. Thomas U. S. A. Catalogued February 6, 1862. Specimen can not be found.

$\frac{5612}{37336}$. Catalogued earlier as No. 4740. Labeled "*Vespertilio oregonensis* U. States Major Le Conte." Catalogued April 13, and November 1, 1861; skull, March 2, 1898.

A mummified skin with wings spread out, in rather poor condition. Skull with zygomata broken and injured about foramen magnum and left otic region.

Myotis californicus pallidus Stephens. Biol. Surv. Coll. See p. 291.

Myotis yumanensis saturatus Miller. Biological Survey collection.

North Amer. Fauna, No. 13, pp. 68–69, October 16, 1897.

$\frac{17398}{24306}$. Skin and skull. Adult male. Hamilton, Washington. September 13, 1889. Collected by Dr. T. S. Palmer. Original number 392.

Well-made skin in good condition; skull perfect.

Vespertilio tenuidorsalis H. Allen. See p. 291.

Myotis thysanodes Miller. Biological Survey collection.

North Amer. Fauna, No. 13, pp. 80–85, pl. I, fig. 5; pl. II, fig. 5; figs. 11*b*, 12*b*, 15*d*, 16–17 in text, October 16, 1897.

29827. In alcohol (skull not removed). Adult female. Fort Tejon, California. July 5, 1891. Collected by Dr. T. S. Palmer. Original number 235.

Specimen in good condition; skull not removed.

Vespertilio volans H. Allen.

Proc. Acad. Nat. Sci. Phila., 1866, p. 282, ordered published August 28, 1866.
= **Myotis californicus** (Audubon and Bachman). See Miller, North Amer. Fauna, No. 13, p. 69, October 16, 1897.

$\frac{5398}{37326}$. In alcohol (lost), and skull. Cape St. Lucas, Lower California, Mexico. Collected by John Xantus. Catalogued October 31, 1861; skull, March 1, 1898.

The alcoholic specimen can not be found; skull perfect.
Dr. H. Allen had but one specimen, designated by number.

Vespertilio yumanensis H. Allen. Cotypes. See page 291.

Genus PIPISTRELLUS.

Pipistrellus hesperus australis Miller. Biological Survey coll.

North Amer. Fauna, No. 13, p. 90, October 16, 1897.

52112. In alcohol (skull not removed). Adult female. Barranca Ibarra, Jalisco, Mexico. May 14, 1892. Collected by E. W. Nelson. Original number 2614.

Specimen in fair condition; viscera protruding and somewhat mutilated; right humerus broken; skull not removed.

Pipistrellus camortæ Miller.

Proc. U. S. Nat. Mus., XXIV, No. 1269, p. 779, May 28, 1902.

111897. In alcohol (skull removed). Adult male. Kamorta, Nicobar Islands. February 12, 1901. Collected by Dr. W. L. Abbott. Catalogued August 17, 1901.

Alcoholic in good condition; skull slightly injured just above the foramen magnum.

Pipistrellus cinnamomeus Miller. Biological Survey collection.

Proc. Acad. Nat. Sci. Phila., 1902, pp. 390–392, September 12, 1902.

100231. Skin and skull. Adult female. Montecristo, Tabasco, Mexico. May 4, 1900. Collected by E. W. Nelson and E. A. Goldman. Original number 14136.

Well-made skin in good condition; skull perfect.

Scotophilus hesperus H. Allen.

Monograph North American Bats, Smithsonian Miscell. Coll., No. 165, p. 43, June, 1864.

=Pipistrellus hesperus (H. Allen). See Miller, North Amer. Fauna, No. 13, p. 88, October 16, 1897.

$\frac{5406}{37406}$. In alcohol (skull removed). Adult male. Old Fort Yuma, San Diego County, California. 1855. Collected by Maj. G. H. Thomas, U. S. A. Catalogued October 31, 1861; skull, May 3, 1898.

Hair on lower back and belly sloughed off; otherwise alcoholic in good condition; skull with central part of each zygoma broken out, right orbital region and right side of rostrum injured.

This specimen may be considered as the type because it is the first one mentioned in the list of three individuals that Dr. H. Allen gives, and the only alcoholic among them. Miller [North Amer. Fauna, No. 13, p. 88] has definitely chosen the above specimen as the type. Again, Miller and Rehn [Proc. Bost. Soc. Nat. Hist., XXX, p. 259] regard Old Fort Yuma, California, as the type-locality. The other two of the original three specimens Nos. 5509 and 5910, came from Poso Creek, Kern County, California, and are dry skins.

Pipistrellus minusculus Miller.

Proc. Wash. Acad. Sci., II, p. 647, fig. 43, December 28, 1900.

84500. In alcohol (skull removed). Adult female. Mount Coffee, Liberia, West Africa. May, 1894. Collected by O. F. Cook. Catalogued April 11, 1898.

Alcoholic in good condition except for an area of sloughed hair on back; skull perfect.

Pipistrellus subflavus obscurus Miller. Biological Survey coll.

North Amer. Fauna, No. 13, p. 93, October 16, 1897.

67723. Skin and skull. Adult female. Lake George, Warren County, New York. September 6, 1894. Collected by Dr. W. K. Fisher. Original number 198.

Well made skin in good condition; skull perfect, except for absence of posterior portion of left mandibular ramus.

Pipistrellus subulidens Miller.

Proc. Wash. Acad. Sci., III, p. 134, March 26, 1901.

104758. In alcohol (skull removed). Adult female. Sirhassen Island, Natuna Islands. June 3, 1900. Collected by Dr. W. L. Abbott. Catalogued December 18, 1900.

Alcoholic in good condition; skull perfect.

Genus EPTESICUS.

Vespertilio fuscus bahamensis Miller. Biological Survey coll.

North Amer. Fauna, No. 13, pp. 101–102, figs. 24*a*, 25*a*, 26*b*, October 16, 1897.

=**Eptesicus fuscus bahamensis** (Miller). See Miller and Rehn, Proc. Bost. Soc. Nat. Hist., XXX, p. 260, December, 1901.

76537. In alcohol (skull not removed). Adult male. Nassau, New Providence, Bahama Islands. Spring, 1894. Collected by C. J. Maynard.

Specimen in good condition; skull not removed.

Scotophilus miradorensis H. Allen. See page 291.

Genus NYCTICEIUS.

Nycticea crepuscularis Le Conte. Cotypes.

M'Murtrie's Cuvier, Animal Kingdom, I, p. 432, 1831.

=**Nycticeius humeralis** (Rafinesque). See Miller, North Amer. Fauna, No. 13, p. 24, October 16, 1897.

4735 and 4736. Skins with skulls inside. "U. States, Maj. Le Conte." Catalogued April 13, 1861.

Specimens in poor condition.

These specimens are regarded as cotypes, more from tradition than anything else. There is nothing in the early description to show that they are cotypes. They were presented to the Museum years ago by Major Le Conte as typical, or perhaps as original specimens. The specimens bear two old labels each, one marked "*Crepuscularis*," the other "*Vespertilio* '*crepuscularis*,'" each in different handwriting. The latter is probably Secretary Baird's handwriting and seems to be identical with that of the entry in the catalogue.

Genus RHOGEËSSA.

Rhogeëssa gracilis Miller. **Biological Survey collection.**

North Amer. Fauna, No. 13, pp. 126–128, pl. I, figs. 7, 12; text fig. 40b, October 16, 1897.

70694. In alcohol. Adult male. Piaxtla, Puebla, Mexico. November 24, 1894. Collected by E. W. Nelson and E. A. Goldman. Original number 7099.

Specimen in fair condition; right humerus and ulna broken; skull attached to body, but separated from skin.

Rhogeëssa minutilla Miller.

Proc. Biol. Soc. Wash., XI, p. 139, May 13, 1897.

63216. Skin with skull. Adult male. Margarita Island, Venezuela. July 8, 1895. Collected by Maj. Wirt Robinson, U. S. A. Original number 463. Catalogued March 25, 1896.

Skin in good condition. Skull with zygomata broken away; audital bullæ missing and posterior basal portion injured.

Rhogeëssa parvula H. Allen. See page 292.

Rhogeëssa tumida H. Allen.

Proc. Acad. Nat. Sci. Phila., 1866, p. 286, ordered published August 28, 1866.

84021. Skull. Adult male. Mirador, Vera Cruz, Mexico. Collected by Col. A. J. Grayson, U. S. A. Catalogued March 1, 1898.

The skin is said to be in alcohol, but can not be found; skull complete except for the loss of both malar bones.

The specimen is accompanied by these two notes signed G. S. M. [iller], jr.

"In the orig. descr. the number of this sp. is said to be 8195. This is an error. [This number in the Museum catalogues does not refer to a bat; it may be an original number.] Specimen recatalogued 3.1.98."

"There is no doubt that this is the type skull. It was returned by H. A.[llen] with no. given in orig. descr."

Genus LASIURUS.

Atalapha semota H. Allen.

Proc. U. S. Nat. Mus., XIII, No. 807, p. 173, September 9, 1890.

=Lasiurus semota (H. Allen). See Miller, Bull. U. S. Nat. Mus., No. 57, p. 222, June 29, 1907.

15631. In alcohol (skull not removed). Adult female. Hawaiian Islands. Collected by Valdemar Knudsen. Catalogued January 4, 1887.

Specimen in good condition.

No type designated. The above specimen is selected as the type, because a great part of the description is based upon it. A table of measurements is given of it; it heads the list of nine specimens, is the first specimen mentioned by Dr. H. Allen, and it is the only one that he considers a "perfect adult specimen."

Atalapha teliotis H. Allen.

Proc. Amer. Philos. Soc., XXIX, p. 5, April 10, 1891.

=**Lasiurus borealis teliotis** (H. Allen). See Miller, North Amer. Fauna, No. 13, p. 110, October 16, 1897.

84555. In alcohol (skull removed and lost). Probably from the southern part of California. Sent to Dr. H. Allen by Dr. J. G. Cooper, of the California Academy of Sciences. It was not catalogued until April 27, 1898.

As Dr. H. Allen remarks in the original description, the specimen is in poor condition. The skin of the head has been split open in order to take out the skull; most of the hair has sloughed from the back.

No type designated. It was unique at the time of the description. The above has always been regarded as the specimen that Dr. H. Allen had and answers to his description in so far as condition is concerned. It bears an original label marked "*Atalapha teliotis*, Cal. Acad. U. S."

Genus DASYPTERUS.

Dasypterus floridanus Miller.

Proc. Acad. Nat. Sci. Phila., 1902, p. 392, issued September 12, 1902.

111379. Skin and skull. Adult female. Lake Kissimmee, Florida. March 28, 1901. Collected by Dr. E. A. Mearns, U. S. A. Original number 5183. Catalogued June 28, 1901.

Well-made skin in good condition; skull perfect.

Lasiurus intermedius H. Allen. See page 292.

Genus CORYNORHINUS.

Corynorhinus macrotis pallescens Miller. Biological Survey coll.

North Amer. Fauna, No. 13, pp. 52–53, pl. III, fig. 2; fig. 10 in text, October 16, 1897.

66534 (not 65534, as in original description). Skin and skull. Adult female. Keam Canyon, Navajo County, Arizona. August 3, 1894. Collected by Dr. A. K. Fisher. Original number 1715.

Well-made skin in good condition. Skull in four fragments, the largest including part of the frontals and the right parietal, two fragments of maxillaries bearing three and five teeth, respectively, left mandibular ramus intact.

Genus KERIVOULA.

Kerivoula depressa Miller.

Proc. Biol. Soc. Wash., XIX, p. 64, May 1, 1906.

$\frac{18533}{38194}$. In alcohol (skull removed). Adult female. Biapo, Carin Hills, northeast Tounghoo, southern Burma. Collected by L. Fea. Original number 29. Catalogued May 2, 1890; skull, February 4, 1904.

Alcoholic, in good condition; skull perfect.

Kerivoula engana Miller.

Proc. U. S. Nat. Mus., XXX, No. 1472, p. 825, June 4, 1906.

141020. In alcohol (skull removed). Adult male. Pulo Dua. Engano Island. west coast of Sumatra. November 3, 1904. Collected by Dr. W. L. Abbott. Original number 3766. Catalogued July 19, 1905.

Alcoholic, in good condition: skull perfect.

Kerivoula minuta Miller.

Proc. Acad. Nat. Sci. Phila., 1898, p. 321, July 12, 1898.

83547. In alcohol (skull removed). Adult male. Trong (or Tarang), lower Siam. September. 1896. Collected by Dr. W. L. Abbott. Catalogued April 28, 1897.

Alcoholic, in good condition: skull perfect.

Genus PHONISCUS.

Phoniscus atrox Miller.

Proc. Biol. Soc. Wash., XVIII, December 9, 1905, p. 230.

123141. In alcohol (skull removed). Adult female. Vicinity of the Kateman River. eastern Sumatra. September 9, 1903. Collected by Dr. W. L. Abbott. Original number 2781. Catalogued January 24, 1904.

Alcoholic, in good condition: skull perfect.

Genus ANTROZOUS.

Antrozous minor Miller. Biological Survey collection.

Proc. Acad. Nat. Sci. Phila., 1902, pp. 389–390, September 12, 1902.

79096. Skin and skull. Comondu, Lower California, Mexico. September 20, 1895. Collected by J. E. McLellan.

Well-made skin in good condition, except for slight mutilation of border of interfemoral membrane. Skull lacks entire basal portion of brain-case, otherwise perfect.

Antrozous pallidus pacificus Merriam. Biological Survey coll.

Proc. Biol. Soc. Wash., XI, p. 180, July 1, 1897.

29815. In alcohol (skull not removed). Adult female. Fort Tejon, California. June 28, 1891. Collected by Dr. C. Hart Merriam. Original number 208.

Specimen in fair condition; hairs on back slipping; skull not removed.

Vespertilio pallidus Le Conte.

Proc. Acad. Nat. Sci. Phila., VII, p. 437, this paper was reported favorably for publication December 25, 1855.

=**Antrozous pallidus** (Le Conte). See H. Allen, Monograph Bats of North America, Smithsonian Miscell. Coll., No. 165, p. 68, June, 1864.

and 5467. Skin without skull. El Paso, Texas, 1851. Collected J. H. Clark during the U. S. and Mexican Boundary Survey.

The specimen is entered in the Museum catalogue twice: First on May 19, 1853, as No. 152, and having skull No. 1134, which is now lost. This entry was made as a deposit, "Dep." Second as No. 5457, with original number marked 152 and no skull number indicated; column for date marked "8–11.34 (?)."

Specimen in good condition, recently made into a modern study skin.

Dr. Harrison Allen, *loc cit.*, p. 69, in second table, regarded this specimen as the type. Baird, U. S. and Mexican Boundary Survey, Report, II, 1859, p. 5, writes "the one described by Major Le Conte was taken at El Paso."

Family MOLOSSIDÆ.

Genus NYCTINOMUS.

Nyctinomus antillularum Miller.

Proc. Acad. Nat. Sci. Phila., 1902, p. 398, September 12, 1902.

113188. In alcohol (skull removed). Adult male. Roseau, Dominica, West Indies. August 5, 1901. Collected by H. Selwyn Branch. Catalogued February 6, 1902.

Alcoholic in good condition; skull perfect.

Dysopes aurispinosus Peale.

U. S. Exploring Expedition, VIII, Mammalia and Ornithology, p. 21, 1848.

=**Nyctinomus macrotis** (Gray). See Dobson, Catalogue Chiroptera British Museum, p. 435, 1878.

3726. Skin preserved in alcohol. Adult male. Peale says: "This remarkable bat flew on board the U. S. ship *Peacock*, off the coast of Brazil, on the 18th of November, when the ship was about one hundred miles from land, south of Cape St. Roque." This specimen is undoubtedly No. 3726, catalogued December 20, 1859, as *Molossus aurispinosus* from Brazil. It was recatalogued as No. 5476, October 31, 1861. There is no record of a skull in either of the entries.

The specimen was a dry skin until September 27, 1899, when it was placed in alcohol by Mr. Gerrit S. Miller, jr., who made a note of the color at that time, viz, "belly wood brown, back between wood brown and russet. 9, 27, '99." It is in good condition.

Type not designated by number, but there is not the slightest doubt that this is the specimen mentioned by Peale.

Nycticea cynocephala Le Conte.

McMurtrie's Cuvier, Animal Kingdom, I, p. 432, 1831.

=**Nyctinomus cynocephalus** (Le Conte). See Miller, Proc. Bost. Soc. Nat. Hist., XXVIII, p. 218, March, 1898.

4742. Skin with skull inside. Collected by Major J. E. Le Conte, probably on the Le Conte plantation, near Riceboro, Georgia. Catalogued April 13, 1861.

Skin in good condition, but with wings spread out.

No type designated. The above seems to be an original specimen, and has "*Cynocephalus*" written on two old labels, and is so entered in the catalogue.

[illegible] Miller.

[illegible]

[illegible] Female. [illegible] Island of Jobie, [illegible] New Guinea. [illegible] Dr. D. Beccari. Original [illegible] skull October 15, 1902.

[illegible]

Nyctinomus [illegible] H. Allen.

[illegible] Nat. Mus. No. 43, p. 171. March [illegible]

=Nyctinomus [illegible] Miller. Proc. Biol. Soc. Wash., XV., p. [illegible] Nat. Mus., [illegible] p. 253. June 29, 1907.

[illegible] Immature female. California [illegible] John Mullan. Alcoholic catalogued August [illegible] November [illegible], 1893.

[illegible] extracted from [illegible] lost, and right half [illegible]

[illegible] Bull. Amer. Mus. Nat. Hist., [illegible]

Nyctinomus orthotis H. Allen.

Proc. Amer. Phil. Soc., XXVI, p. [illegible], December 18, 1889.

[illegible]. Skin (preserved in alcohol) and skull. Spanishtown, Jamaica, West Indies. Collected by W. T. March. Probably August, 1868. Skin catalogued May 4, 1869; skull, August 17, 1898.

Skin in good condition; a good deal of the posterior parts of the skull broken away.

Nyctinomus pusillus Miller.

Proc. Biol. Soc. Wash., XV, p. 245, December 16, 1902.

[illegible]. In alcohol (skull removed). Adult female. Aldabra Island, Indian Ocean. Collected by Dr. W. L. Abbott. Alcoholic catalogued June 30, 1893; skull, February 12, 1900.

Alcoholic in good condition; left half of posterior part of brain-case of skull broken away.

Type designated by No. [illegible], an error for [illegible].

Nyctinomops yucatanicus Miller. Biological Survey collection.

Proc. Acad. Nat. Sci. Phila., 1902, pp. 393–395, September 12, 1902.

Nyctinomus yucatanicus (Miller).

108166. Skin and skull. Adult female. Chichenitza, Yucatan, Mexico. February 9, 1901. Collected by E. W. Nelson and E. A. Goldman. Original number 14521.

Well made skin in good condition; skull perfect.

Genus MOLOSSUS.

Molossus nigricans Miller. Biological Survey collection.

Proc. Acad. Nat. Sci. Phila., 1902, pp. 395–396, September 12, 1902.

90941. Skin and skull. Adult male. Acaponeta, Tepic, Mexico. August 2, 1897. Collected by E. W. Nelson and E. A. Goldman. Original number 11433.

Well made skin in good condition; skull perfect, except for absence of right angular process of mandible.

Molossus pretiosus Miller.

Proc. Acad. Nat. Sci. Phila., 1902, p. 396, September 12, 1902.

102761. Skin and skull. Adult male. La Guaira, Venezuela. July 13, 1900. Collected by Maj. Wirt Robinson, U. S. A., and Dr. M. W. Lyon, jr. Original number 106. Catalogued September 20, 1900.

Well-made skin in good condition; skull perfect.

Molossus pygmæus Miller.

Proc. Biol. Soc. Wash., XIII, p. 162, October 31, 1900.

102104. In alcohol (skull removed). Adult female. In an attic of a house near Willemstad, Curaçao, West Indies. January 16, 1900. Collected by Leon J. Guthrie. Catalogued May 22, 1900.

Alcoholic in good condition; skull perfect.

Order PRIMATES.

Family LEMURIDÆ.

Genus NYCTICEBUS.

Nycticebus bancanus Lyon.

Proc. U. S. Nat. Mus., XXXI, No. 1494, p. 536, November 9, 1906.

124907. Skin and skull. Adult female. Klabat Bay, island of Banka, east of Sumatra. June 24, 1904. Collected by Dr. W. L. Abbott. Original number 3432. Catalogued December 5, 1904.

Well-made skin in good condition; skull perfect.

Nycticebus borneanus Lyon.

Proc. U. S. Nat. Mus., XXXI, No. 1494, p. 535, pl. XIII, fig. 4, November 9, 1906.

142234. Skin and skull. Adult male. Along the Sakaiam River, a tributary of the Kapuas River, Sanggau district, western Borneo. August 15, 1905. Collected by Dr. W. L. Abbott. Original number 4322. Catalogued January 20, 1906.

Well-made skin in good condition; skull perfect, except small upper right incisor broken off at alveolus.

Nycticebus coucang natunæ Stone and Rehn.

Proc. Acad. Nat. Sci. Phila., 1902, p. 140, June 4, 1902.

=**Nycticebus natunæ** (Stone and Rehn). See Lyon, Proc. U. S. Nat. Mus., XXXI, No. 1494, p. 534, November 9, 1906.

104599. Skin and skull. Adult male. Bunguran, Natuna Islands. July 28, 1900. Collected by Dr. W. L. Abbott. Original number 602. Catalogued December 15, 1900.

Well-made skin in good condition; skull perfect.

Family CALLITRICHIDÆ.

Genus LEONTOCEBUS.

Midas elegantulus Slack.

Proc. Acad. Nat. Sci. Phila., 1861, p. 463, ordered printed December 31, 1861.

=**Leontocebus rufiventer** (Gray).

$\frac{5132}{37870}$. Skin and skull. Adult male. Amazon River. Collected by Lieut. W. L. Herndon, U. S. N. Skin catalogued between November 18, 1861, and February, 1862; skull, March 12, 1900.

Skin with tip of tail missing and skull with greater portion of the occipital bone broken away; specimen otherwise complete and in good condition.

Type not designated by number. The above is the only specimen in the collection with the data of "the typical specimen."

Family CEBIDÆ.

Genus ALOUATTA.

Alouatta palliata mexicana Merriam. Biological Survey collection.

Proc. Biol. Soc. Wash., XV, p. 67, March 22, 1902.

79398. Skin and skull. Adult male. Minatitlan, Vera Cruz, Mexico. April 23, 1896. Collected by E. W. Nelson and E. A. Goldman. Original number 9551.

Well-made skin in good condition; skull perfect, except for slight injury to angle of right mandibular ramus.

Family CERCOPITHECIDÆ.

Genus MACACA.

Macaca adusta Miller.

Proc. U. S. Nat. Mus., XXXIX, No. 1436, p. 559, pls. XIII, fig. 2; XIV, fig. 2; XV, fig. 2; XVI, fig. 2; February 3, 1906.

124023. Skin and skull. Adult male. Champang, Tenasserim. December 22, 1903. Collected by Dr. W. L. Abbott. Original number 2929. Catalogued July 26, 1904.

Well-made skin in good condition; skull perfect.

Cynomolgus mindanensis apoensis Mearns.

Proc. U. S. Nat. Mus., XXVIII, No. 1402, p. 429, May 13, 1905.

=**Macaca mindanensis apoensis** (Mearns).

125321. Skin and skull. Adult female. Mount Apo (altitude of 6,000 feet), southern Mindanao, Philippine Islands. June 25, 1904. Collected by Dr. E. A. Mearns, U. S. A. Original number 5670. Catalogued December 14, 1904.

Well-made skin in good condition; skull perfect.

Macaca broca Miller.

Proc. U. S. Nat. Mus., XXIX, No. 1436, p. 558, February 3, 1906.

$\frac{19211}{34930}$. Skin and skull. Adult male. Along the Sapagaya River, northeastern Borneo. November 21, 1887. Collected by C. F. Adams. Skin catalogued December 2, 1890; skull, December 5, 1890.

Well-made skin in good condition; skull perfect.

Cynomolgus cagayanus Mearns.

Proc. U. S. Nat. Mus., XXVIII, No. 1402, p. 431, May 13, 1905.

=**Macaca cagayana** (Mearns).

125325. Skin and skull. Adult male. Cagayan Sulu Island, Sulu Sea (near Borneo). February 25, 1904. Collected by Dr. E A. Mearns, U. S. A. Original number 5771. Catalogued December 14, 1902.

Well-made skin in fair condition; several bare spots on arms and legs and on belly; originally preserved for some months in alcohol, but now a dry skin. (See under heading "Color" in the original description.) Skull perfect except loss of right c_1, i_2, and left i^2.

Macacus fuscus Miller.

Proc. U. S. Nat. Mus., XXVI, No. 1317, p. 476, February 3, 1903.

114164. Skin and skull. Old male. Simalur Island, northwestern Sumatra. November 20, 1901. Collected by Dr. W. L. Abbott. Original number 1348. Catalogued August 26, 1902.

Well-made skin in good condition; skull perfect.

Macaca insulana Miller.

Proc. U. S. Nat. Mus., XXIX, No. 1436, p. 560, February 3, 1906.

104441. Skin and skull. Adult male. Chance Island, Mergui Archipelago. January 1, 1900. Collected by Dr. W. L. Abbott. Original number 199. Catalogued November 6, 1900.

Well-made skin in good condition; skull perfect.

Cynomolgus mindanensis Mearns.

Proc. U. S. Nat. Mus., XXVIII, No. 1402, p. 4[illegible], May 13, 1905.
=Macaca mindanensis Mearns.

1254[illegible]. Skin and skull. Adult male. Pantar (altitude 1,900 feet), Mindanao, Philippine Islands. August 25, 1903. Collected by Dr. E. A. Mearns, U. S. A. Original number 5620. Catalogued April [illegible], 1904.

Well-made skin in fair condition; bare spots on forehead and arms; skull perfect except [illegible] left [illegible] and [illegible].

Macacus pagensis Miller.

Smithsonian Misc. Coll., XLV, No. 1420, p. 61, November 6, 1903.

121653. Skin and skull. Adult female. South Pagi Island, off west coast of Sumatra. November 17, 1902. Collected by Dr. W. L. Abbott. Original number 2053. Catalogued July 31, 1903.

Well-made skin in good condition; skull perfect.

Macacus phæura Miller.

Smithsonian Misc. Coll., XLV, No. 1420, p. 63, November 6, 1903.

121870. Skin and skull. Adult male. Siaba Bay, Nias Island, off west coast of Sumatra. March 20, 1903. Collected by Dr. W. L. Abbott. Original number 2389. Catalogued August 2, 1903.

Well-made skin in good condition; skull perfect, except shot hole in base of cranium.

Macacus pumilus Miller.

Proc. Wash. Acad. Sci., II, p. 241, August 20, 1900.

101639. Skin and skull. Adult male. Pulo Bunoa, Tambelan Islands, South China Sea. August 6, 1899. Collected by Dr. W. L. Abbott. Catalogued January 19, 1900.

Well-made skin in good condition; skull perfect; an old specimen, teeth worn, especially the canines, the left lower one of which is lost from age, and the two middle lower incisors also lost from age.

Cynomolgus suluensis Mearns.

Proc. U. S. Nat. Mus., XXVIII, No. 1402, p. 430, May 13, 1905.
=Macaca suluensis (Mearns).

125324. Skull (no skin). Adult male. Foot of Crater Lake Mountain, island of Sulu, Philippine Islands. November 16, 1903. Collected by Dr. E. A. Mearns, U. S. A. Original number 5750. Catalogued December 14, 1904.

Skull perfect, except slight deformity of incisors.

Macacus umbrosus Miller.

Proc. U. S. Nat. Mus., XXIV, No. 1269, p. 789, May 28, 1902.

111795. Skin and skull. Adult male. Little Nicobar, Nicobar Islands. February 25, 1901. Collected by Dr. W. L. Abbott. Original number 888. Catalogued August 14, 1901.

Well-made skin in good condition; skull perfect.

Macacus rhesus villosus True.

Proc. U. S. Nat. Mus., XVII, No. 976, p. 2, May 8, 1894.

$\frac{20120}{35485}$. Skin and skull. Adult male. Lolab, Kashmir. September 8, 1891. Collected by Dr. W. L. Abbott.

Well-made skin in good condition; skull perfect, but evidently at one time in some pickling fluid, as it is slightly decalcified, especially the enamel of the teeth.

Genus PRESBYTIS.

Presbytes batuanus Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 65, November 6, 1903.

121810. Skin and skull. Adult male. Pulo Pinie, Batu Islands, off west coast of Sumatra. March 4, 1903. Collected by Dr. W. L. Abbott. Original number 2369. Catalogued August 2, 1903.

Well-made skin in good condition; skull perfect.

Presbytis cana Miller.

Proc. U. S. Nat. Mus., XXXI, No. 1485, p. 275, September 11, 1906.

122915. Skin and skull. Adult male. Pulo Kundur, Rhio-Linga Archipelago. June 28, 1903. Collected by Dr. W. L. Abbott. Original number 2558. Catalogued January 22, 1904.

Well-made skin in good condition; skull perfect.

Presbytis carimatæ Miller.

Proc. U. S. Nat. Mus., XXXI, No. 1481, p. 65, July 23, 1906.

125157. Skin and skull. Adult female. Telok Edar, Karimata Island. September 2, 1904. Collected by Dr. W. L. Abbott. Original number 3717. Catalogued December 9, 1904.

Well-made skin in good condition; skull perfect.

Type designated as No. 125158. It should have been 125157. The skull selected as type and marked as such and measured by Mr. Miller is No. 125157. The skin on which he tied the red label was No. 125158. As the skin of No. 125157 is exactly like that of 125158, and as the skull of No. 125157 is the only one carefully measured, No. 125157 is here considered the type.

Presbytes rhionis Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 64, November 6, 1903.

115665. Skin and skull. Adult female. Telok Pemudong, Pulo Bintang, Rhio-Linga Archipelago. August 15, 1902. Collected

by Dr. W. L. Abbott. Original number 1888. Catalogued January 5, 1903.

Well-made skin in good condition; skull perfect.

Genus SIMIAS.

Simias concolor Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 67, pls. XIV, XV, XVI, November 6, 1903.

121659. Skin and skull. Adult male. South Pagi Island, off west coast of Sumatra. December 3, 1902. Collected by Dr. W. L. Abbott. Original number 2103. Catalogued July 31, 1903.

Well-made skin in good condition; skull perfect.

Family HYLOBATIDÆ.

Genus SYMPHALANGUS.

Symphalangus klossii Miller.

Smithsonian Miscell. Coll., XLV, No. 1420, p. 70, pls. XVII and XVIII, fig. 2, and pl. XIX, fig. 1, November 6, 1903.

121678. Skin and skull. Adult male. South Pagi Island, off west coast of Sumatra. November 13, 1902. Collected by Dr. W. L. Abbott. Original number 2032. Catalogued July 31, 1903.

Well-made skin in good condition; skull perfect.

TYPE-SPECIMENS THAT SHOULD BE IN THE NATIONAL MUSEUM COLLECTION, BUT NO PART OF WHICH CAN NOW BE FOUND.

Berardius bairdii Stejneger.

Proc. U. S. Nat. Mus , VI, p. 75, June 22, 1883.

20992. Skull. Immature. Stare Gavan, eastern shore of Bering Island. Autumn of 1882. Collected by Dr. L. Stejneger. Original number 1520. Catalogued November 24, 1883.

Skull in good condition.

Type designated by the original number.

There is something wrong about the record of this skull. While it appears correct, the measurements do not agree with Doctor Stejneger's original measurements.—F. W. True.

Phocæna australis Peale.

U. S. Exploring Expedition, VIII, Mammalia and Ornithology, p. 33, pl. VI, fig. 2, 1848.

=?Lagenorhynchus obscurus (Gray). See True, Bull. U. S. Nat. Mus., No. 36, p. 104, 1889.

Type-locality.—South Atlantic Ocean, off coast of Patagonia.

Nothing is known about this specimen. It is not included in Peale's list of specimens, *loc. cit.*, p. 205.

Delphinus albirostatus Peale.

U. S. Exploring Expedition, VIII, Mammalia and Ornithology, p. 34, pl. VII, fig. 2, 1848. See True, Bull. U. S. Nat. Mus., No. 36, p. 62, 1889.

Type-locality.—Pacific Ocean, lat. 2° 47′ 5″ S., long. 174°13′ W.

Nothing is known about this specimen. It is not in Peale's list of specimens, *loc. cit.*, p. 305. Cassin says: "We find no specimen in the collection of the expedition." (U. S. Explor. Exped. Mamm. and Ornith., p. 32, 1858.)

Delphinapterus borealis Peale.

U. S. Exploring Expedition, VIII, Mammalia and Ornithology, p. 35, pl. VIII, fig. 2, 1848.

=Tursio borealis (Peale). See True, Bull. U. S. Nat. Mus., No. 36, p. 80, 1889.

Type-locality.—Pacific Ocean, lat. 46° 6′ 50″ N., long. 134° 5′ W.

Nothing is known about this specimen. It is not included in Peale's list of specimens, *loc. cit.*, p. 305. Cassin remarked that he had "no specimens for examination." (Cassin, U. S. Explor. Exped., Mamm. and Ornith., p. 30, 1858.)

Delphinus bairdii Dall. Cotypes.

Proc. California Acad. Sci., V, p. 12, printed in advance January 29, 1873.

=Delphinus delphis Linnæus. See True, Bull. U. S. Nat. Mus., No. 36, pp. 45, 53, 1889.

Two females. Point Arguello, California. 1872. Collected by Capt. C. M. Scammon. "One entire skeleton has been forwarded to Washington."

A search through the Museum collection and catalogues fails to reveal these specimens. They may never have reached the Museum.

The cotypes were not designated by numbers.

Delphinus lateralis Peale.

U. S. Exploring Expedition. VIII. Mammalia and Ornithology, p. 35, pl. VII, fig. 1.

=Prodelphinus ? lateralis (Peale). See True, Bull. U. S. Nat. Mus., No. 36, p. 95.

Type-locality.—Pacific Ocean. lat. 13° 58′ N., long. 161° 22′ W.

Nothing is known about this specimen. It is not in Peale's list of specimens, *loc. cit.*, p. 305. (Cassin remarks, "We find no specimen in the collection of the expedition." U. S. Explor. Exped., Mamm. and Ornith., 1858, p. 33.)

Cervus macrotis californicus Caton.

Amer. Nat., X, p. 464. August, 1876.

=Odocoileus hemionus californicus (Caton). See Thompson, Forest and Stream, LI, p. 286, October 8, 1898.

Type-locality.—Near Gaviota Pass, 40 miles up the coast from Santa Barbara, California.

Caton, p. 468, says, "As soon as the deer reached camp I selected a fair specimen, a buck, which I judged to be four years old, and prepared the skin and necessary parts of the skeleton for mounting. This I subsequently sent to the Smithsonian Institution. Professor Baird has expressed much interest about it, and assured me that it would be mounted and added to the collection of American quadrupeds at the Centennial [Exposition, Philadelphia, 1876], when those who take an interest in these studies may examine and compare it with others." Specimen killed March 22, 1876, probably.

An examination of the catalogue for 1875–76 shows the specimen to be [illegible], catalogued in the spring of 1876. Nothing further is known of it.

Cervus lewisii Peale.

U. S. Exploring Expedition, VIII, Mammalia and Ornithology, p. 39, 1848.

=Odocoileus columbianus (Richardson). See Trouessart, Catalogus Mammalium, p. 894, 1897.

There should be two cotypes, one from Feather River, upper California, the other from San Francisco Bay.

Nothing is known of their whereabouts; not even numbers are known.

Lepus audubonii Baird.

Mammals of North America, p. 608, pls. XIII (animal) and LVIII (skull).

$\frac{1163}{2045}$. Skin and skull, both lost. San Francisco, California. Received from Lieut. R. S. Williamson; collected by Dr. J. S. Newberry. Catalogued December 31, 1855.

No type was designated in the original description, and in the description itself there is nothing to show that Baird had in mind any particular one of the five specimens coming from three separated localities. (The specimens labeled "Presidio" probably came from Monterey, as is seen by reading the original labels and the entry in the catalogue. On pl. XIII Baird figures the entire animal, but does not state which specimen; however, on pl. LVIII a skull is figured and referred to by number, 2045. As this specimen seems to be mentioned more ...ularly than any other specimen, it seems well to take it as the type. The ...ality is thus restricted to San Francisco, California, as is done by Miller ...m. (Proc. Bost. Soc. Nat. Hist., XXX, p. 185, December, 1901.)

Cricetodipus parvus Peale.

U. S. Exploring Expedition, VIII, Mammalia and Ornithology, p. 53, 1848.
=**Perognathus parvus** (Peale). See Cassin, U. S. Exploring Expedition, Mammalia and Ornithology, p. 48, 1858.

Type-locality.—Oregon. Assumed to be The Dalles. See Osgood, North Amer. Fauna, No. 18, pp. 34–36, September 20, 1900.

Specimen should be in the Museum with the U. S. Exploring Expedition material. Nothing is known of it; not even number can be traced.

Mus vitiensis Peale.

U. S. Exploring Expedition, VIII, Mammalia and Ornithology, p. 49, 1848.
=**Mus musculus vitiensis** (Peale). See Trouessart, Catalogus Mammalium, p. 487, 1897.

Type-locality.—Fiji Islands.

Specimen should be in the Museum, with other U. S. Exploring Expedition material. It is probably No. 3731, an old mounted specimen that can not now be found. Catalogued December 20, 1859.

Mus peruvianus Peale.

U. S. Exploring Expedition, VIII, Mammalia and Ornithology, p. 51, 1848.
=?**Oryzomys peruvianus** (Peale). See Trouessart, Catalogus Mammalium, p. 528, 1897.

Type-locality.—Callao, Peru.

The specimen should be in the Museum, with other U. S. Exploring Expedition material. It is probably No. 4955, an alcoholic, entered in the catalogue May 30, 1861, as *Mus musculus* from Callao, which can not be found.

Arvicola montana Peale.

U. S. Exploring Expedition, VIII, Mammalia and Ornithology, p. 44, 1848.
=**Microtus montanus** (Peale). See Trouessart, Catalogus Mammalium, p. 563, 1897.

Peale says, "Our specimen was obtained on the 4th of October, near the headwaters of the Sacramento River, in California."

The specimen can not be found. Its number is not known.

Arvicola (Pitymys) pinetorum quasiater Coues.

Proc. Acad. Nat. Sci. Phila., 1874, p. 191, December 15, 1874.
=**Microtus quasiater** (Coues). See Miller, North Amer. Fauna, No. 12, p. 60, July 23, 1896.

3524. Skin. Jalapa, Vera Cruz, Mexico. Collected by R. Montis d'Oca. Catalogued March 18, 1859.

The specimen can not found. There is no record of a skull. Dr. E. Coues says he had not seen the skull.

Type designated by number.

Sciurus fossor Peale.

U. S. Exploring Expedition, VIII, Mammalia and Ornithology, p. 55, 1848.

Type-locality.—Probably southern Oregon.

The specimen should be in the Museum, with other U. S. Exploring Expedition material, but nothing is known of it. Cassin, U. S. Explor. Exped. Mamm. and Ornith., 1858, says specimens are in Academy of Natural Sciences, Philadelphia, and in National Museum and mentions it in list on page 424.

Macrotus californicus Baird.

Proc. Acad. Nat. Sci. Phila., X, p. 116, presented for publication May 4, 1858.

=**Otopterus californicus** (Baird). See Miller and Rehn, Proc. Boston Soc. Nat. Hist., XXX, p. 278, December 27, 1901.

2347. In alcohol. Fort Yuma, California. Collected by Maj. G. H. Thomas, U. S. A. Catalogued March 27, 1857.

Specimen can not be found. Dr. H. Allen evidently had it in 1894. See p. 39, Monograph Bats North America, March 14, 1894.

Type not designated by number in original description. One specimen is implied, and a table of measurements is given agreeing exactly with those given for No. 2347 in Baird's Report U. S. and Mex. Bound. Surv., II, Pt. 2, p. 4, 1859.

Vespertilio agilis H. Allen.

Proc. Acad. Nat. Sci. Phila., 1866, p. 282, ordered published August 28, 1866.

Dr. H. Allen says, "One individual. ♀. No. ? Mus. of Smithsonian Institution. Alcohol. Doctor Sartorius. Mirador, Mexico."

Nothing is known of the specimen.

Vespertilio evotis H. Allen. Lectotype.

Monograph of Bats of North America, Smithsonian Miscell. Coll., No. 165, p. 48, June, 1864.

=**Myotis evotis** (H. Allen). See Miller, North Amer. Fauna, No. 13, p. 77, October 16, 1897.

5389. In alcohol. Monterey, California. Collected by A. S. Taylor. Catalogued October 31, 1861.

The following quotation from Miller, *loc. cit.*, p. 77, is the reason for considering this specimen the type:

"*Type-locality.*—Not stated, and no type designated. In the original description specimens are mentioned from the upper Missouri River and the Pacific coast from Puget Sound to Cape St. Lucas. Monterey, Cal. (one of the localities given), may be selected as the type locality."

No. 5389 is the only specimen from Monterey, and Monterey having been chosen as the type-locality, 5389 should be considered as the type. The specimen can nowhere be found in the collection.

Vespertilio exiguus H. Allen.

Proc. Acad. Nat. Sci. Phila., 1866, p. 281, ordered published August 28, 1866.

5373. In alcohol. Aspinwall, New Granada, the present Colon.

Panama. Received from Dr. S. Hayes. Catalogued October 30, 1861.

Dr. H. Allen had but one specimen, a female in alcohol, designated by number. It can not be found.

Vespertilio mundus H. Allen.

Proc. Acad. Nat. Sci. Phila., 1866, p. 280, ordered published August 28, 1866.

5547. In alcohol. Maracaibo, Venezuela. Young female. Catalogued February 6, 1862.

Dr. H. Allen had but one specimen designated by number. The specimen can not be found.

Myotis californicus pallidus Stephens. Biol. Survey Collection.

Proc. Biol. Soc. Wash., XIII, p. 153, June 13, 1900.

99829. Skin and skull. Male. Vallecito, San Diego County, California. April 1, 1895. Collected by F. Stephens.

Specimen probably mislaid temporarily; formerly in collection, but not found at present.

Vespertilio tenuidorsalis H. Allen.

Proc. Acad. Nat. Sci. Phila., 1866, p. 283, ordered published August 28, 1866.
=**Myotis californicus** (Audubon and Bachman). See Miller, North Amer. Fauna, No. 13, p. 36, October 16, 1897.

Dr. H. Allen says, "One individual. ♀. No. 5533. Mus. Smithsonian Institution. Alcohol. Cape St. Lucas, Lower Cal. John Xantus." There is some mistake in the number, as the catalogue number 5533 calls for a "*V. nitidus*, Puget Sound."

This specimen can not be found in the National Museum. Mr. James A. G. Rehn has informed us it is now in the collection of the Academy of Natural Sciences, Philadelphia.

Vespertilio yumanensis H. Allen. Cotypes.

Monograph Bats North America, Smithsonian Miscell. Coll., No. 165, p. 58, June, 1864.
=**Myotis yumanensis** (H. Allen) Miller, North Amer. Fauna No. 13, p. 66, October 16, 1897.

No type designated. Four specimens are measured 5367, 6019, 6020, 6021, and all must be considered as cotypes; no preference for one over the other is shown, and all come from one locality, Fort Yuma, California, collected by Maj. G. H. Thomas, U. S. A., in 1855. All were in alcohol. None of the specimens can be found. In his "List of Specimens" Allen says 36 individuals were under number 5367. The catalogue says 8 bore that number.

Scotophilus miradorensis H. Allen.

Proc. Acad. Nat. Sci. Phila., 1866, p. 287, ordered published August 28, 1866.
=**Eptesicus fuscus miradorensis** (H. Allen). See Miller, Bull. U. S. Nat. Mus., No. 57, p. 209, June 29, 1907.

No type mentioned. Dr. H. Allen says, "One individual. ♀. Mus. of Smithsonian Institution. Alcohol. Mirador, Mexico. Dr. Sartorius." It is undoubtedly No. 5411, catalogued October 31, 1861, along with other bats that Dr. H. Allen was working with at the time; 5411 has the same data that Doctor Allen gives. Also see his second Monographs of Bats of North America, 1893, p. 121, where 5411 is given in the list of specimens of *Adelonycteris fuscus*.

It can not be found.

Rhogeëssa parvula H. Allen.

Proc. Acad. Nat. Sci. Phila., 1866, p. 285, ordered published August 28, 1866.

7841. Adult male. In alcohol. Tres Marias Islands, Mexico. Received from Col. A. J. Grayson, U. S. A. Catalogued in first half of 1865.

The specimen can not be found in the National Museum. Mr. James A. G. Rehn informs us it is in the collection of the Philadelphia Academy of Natural Sciences, and in very bad condition.

Lasiurus intermedius H. Allen.

Proc. Acad. Nat. Sci. Phila., 1862, p. 246, ordered published April 29, 1862.

=**Dasypterus intermedius** (H. Allen). See H. Allen, Monograph, Bats of North America. Bull. U. S. Nat. Mus., No. 43, p. 137, March 14, 1894.

6136. In alcohol. Matamoras, Tamaulipas, Mexico. Received from Lieut. D. N. Couch, U. S. A. (Berlandier collection). Catalogued February 7, 1863.

The specimen can not be found.

In the original description a table of measurements is given, and by referring to p. 26 of H. Allen's Monograph of Bats of North America, June, 1864, it is seen that these measurements refer to the last specimen in the table of measurements there given. Unfortunately it is not numbered. By checking off the six preceding numbers in the "List of specimens" it is seen that the single unnumbered specimen in the table of measurements must have been 6136. Since that was the specimen measured in the original description, it is here regarded as type. Of the seven bats listed in the original description, 5328 is the only one that can be found.

SUMMARY OF THE TYPE-SPECIMENS OF MAMMALS IN THE UNITED STATES NATIONAL MUSEUM, GROUPED BY AUTHORS AND BY COLLECTORS.

The total number of type-specimens of mammals in the United States National Museum, as shown by the foregoing catalogue, is 1,405. Of these, 692 are in the collection of the Division of Mammals and 713 in the Biological Survey Collection.

As a matter of some interest, the following tables have been prepared. They show the respective number of type-specimens described by different authors, and similarly the number collected by different persons.

A large proportion of the types have been described by recent authors, who have worked with large series of specimens and with careful as well as modern methods of discrimination. Nearly every prominent worker in the history of American mammalogy is represented. Thus, the list includes such well-known names as Audubon, Bachman, Baird, Cassin, Cope, Coues, Kennicott, LeConte, and Peale, and others equally prominent among the living zoologists. The list of collectors also includes many highly honored names, especially of those connected with early government exploring expeditions and surveys. The large number of type-specimens of African and Malayan mammals is due almost entirely to the enthusiasm of Dr. W. L. Abbott, who has devoted the best years of his life to exploring regions previously but little known. He has generously presented his collections to the National Museum. Dr. E. A. Mearns, U. S. A., has also been a generous contributor of specimens, especially from the region of the Mexican boundary and from the Philippines. All the types in the Biological Survey collection are the result of recent work, and a great majority of them were collected and described by mammalogists on the staff of the Survey.

Type-specimens not at present existing in the National Museum are not taken into account in the following lists. The discrepancy between the number of authors and the number of collectors is caused by the inclusion of cotypes described by one author, but collected by more than one person.

AUTHORS WHO HAVE DESCRIBED TYPE-SPECIMENS OF MAMMALS IN THE UNITED STATES NATIONAL MUSEUM, EXCLUSIVE OF THE BIOLOGICAL SURVEY COLLECTION.

Dr. Harrison Allen	17
Dr. J. A. Allen	21
Dr. Knud Andersen	9
John James Audubon and Rev. John Bachman	1
Dr. W. O. Ayres	1
Rev. John Bachman (see also Audubon and Bachman)	1
Secretary S. F. Baird	57
Dr. J. L. Berlandier	1
John Cassin	1
Frank M. Chapman	1
Dr. J. G. Cooper	1
Prof. E. D. Cope	11
Dr. Elliott Coues, U. S. A.	12
Dr. W. H. Dall	2
Dr. Theodore Gill	6
Dr. F. V. Hayden	1
Robert Kennicott	4
Major John Eatton LeConte, U. S. A.	11
Dr. Marcus W. Lyon, jr. (see also Robinson and Lyon)	37
Dr. E. A. Mearns, U. S. A	77
Dr. C. Hart Merriam	28
Gerrit S. Miller, jr	317
E. W. Nelson	7
Wilfred H. Osgood	4
Titian R. Peale	10
Edward A. Preble	1
Dr. D. W. Prentiss, jr	1
James A. G. Rehn (see also Stone and Rehn)	1

Samuel N. Rhoads 1
Major Wirt Robinson, U. S. A., and Dr. M. W. Lyon, jr. 2
Hon. Walter Rothschild 1
Capt. C. M. Scammon 1
Dr. R. W. Shufeldt, U. S. A. 1
Dr. J. H. Slack 1
Dr. Leonhard Stejneger 1
Frank Stephens 1
Witmer Stone and James A. G. Rehn. 1
Oldfield Thomas 1
C. H. Townsend 1
Dr. F. W. True 34
Dr. S. W. Woodhouse 5

692

COLLECTORS OF TYPE-SPECIMENS OF MAMMALS IN THE COLLECTION OF THE UNITED STATES NATIONAL MUSEUM, EXCLUSIVE OF THE BIOLOGICAL SURVEY COLLECTION.

Dr. W. L. Abbott 286
Col. J. J. Abert, U. S. A. 1
C. F. Adams 2
Dr. J. A. Allen 1
A. W. Anthony 2
F. B. Armstrong 1
Dr. W. O. Ayres 2
Secretary S. F. Baird 2
G. L. Bates 1
C. W. Baxter 1
Dr. D. Beccari 1
Paul Beckwith 2
Dr. James E. Benedict 1
Paul D. Bergen 1
Dr. J. L. Berlandier 3
Dr. L. F. H. Birt 1
Ferdinand Bischoff 1
Dr. C. C. Boyle 1
H. Selwyn Branch 5
Dr. T. M. Brewer 1
R. E. Carson 1
Charles Cavileer 2
Hon. William Astor Chanler 2
Hon. William Astor Chanler and Capt. Ludwig Ritter von Höhnel. Austro-Hungarian Navy 1
J. H. Clark 9
O. F. Cook 1
Dane Coolidge 3
Dr. J. G. Cooper 8
Juan Cooper 1
William Cooper 1
Prof. E. D. Cope 1
C. B. Cory 1
Gen. D. N. Couch, U. S. A. 4
Dr. Elliott Coues, U. S. A. 6
Dr. S. W. Crawford 1
Rolla P. Currie 6
Dr. W. H. Dall 3
Lieut. John Davison 1
[illegible] 1
[illegible] 1
[illegible] 1
[illegible] 2
[illegible] 1
Exploring Expedition, United States. (Mainly collected by T. R. Peale.) 13
James Fairie 1
Leonardo Fea 1
John Feilner 1
G. Flemming 2
William T. Foster 1
Prof. William M. Gabb 7
George Gibbs 1
E. A. Goldman 1
B. F. Goss 1
W. Grasshoff 1
Col. A. J. Grayson, U. S. A. 3
Guatemala Exhibit, World's Columbian Exposition, Chicago, 1893 1
Leon J. Guthrie 6
Dr. J. F. Hammond 1
Dr. W. A. Hammond, U. S. A. 2
W. L. Hardisty 1
Dr. F. V. Hayden 6
Lieut. W. L. Herndon, U. S. N. 1
Capt. Ludwig Ritter von Höhnel, Austro-Hungarian Navy. (See Chanler and von Höhnel.)
F. X. Holzner (see also Mearns and Holzner) 3
Charles Hose 1
Ernest and Charles Hose 1
H. S. Howland 1
Dr. P. R. Hoy 2
J. W. Humphreys 1
Col. E. Jewett 1
Prof. Walter R. Johnson 1
Dr. David Starr Jordan 1
P. L. Jouy 2
Dr. C. B. Kennerly 3
Robert Kennicott 2
C. Boden Kloss 5
Valdemar Knudsen 1
F. Kreutzfeld 4
Maj. John Eatton LeConte, U. S. A. .. 9
Dr. John Lawrence LeConte 1
J. Alden Loring 2
Dr. M. W. Lyon, jr. (See Robinson and Lyon.)

C. S. McCarthy	1
L. M. McCormick	1
P. McDonough	1
Mrs. C. McElroy	1
Dr. W J McGee	1
R. Macfarlane	3
Dr. G. E. Manigault	1
W. T. March	1
Dr. E. A. Mearns, U. S. A.	46
Dr. E. A. Mearns, U. S. A., and F. X. Holzner	19
J. W. Mitchell	2
Prof. E. S. Morse	1
John Mullan	1
John Murdoch	1
E. W. Nelson	6
Dr. J. S. Newberry	1
Dr. E. Palmer	1
William Palmer	1
William Palmer and J. H. Riley	2
Titian R. Peale. (See U. S. Exploring Expedition.)	
O. A. Peterson	5
Gen. J. Pope, U. S. A.	1
John Potts	1
Dr. D. W. Prentiss, jr. (See True and Prentiss.)	
B. S. Rairden, U. S. Consul, Batavia.	1
Gen. P. H. Ray, U. S. A.	1
Dr. C. W. Richmond. (See Stejneger and Richmond.)	
J. H. Riley (see also Palmer and Riley)	1
Major Wirt Robinson, U. S. A.	3
Major Wirt Robinson, U. S. A., and Dr. M. W. Lyon, jr.	3
Edward Samuels	3
Dr. C. Sartorius	2
Capt. C. M. Scammon	4
Dr. Arthur Schott	6
Ernest Thompson Seton	1
Dr. R. W. Shufeldt, U. S. A.	1
Dr. G. G. Shumard	1
W. W. Simpson	2
William G. Smith	1
Capt. Howard Stansbury's Expedition to Great Salt Lake	1
Prof. J. B. Steere	2
Miss Thora Steineger	1
Dr. Leonhard Stejneger	6
Dr. Leonhard Stejneger and Dr. C. W. Richmond	1
Mrs. Leonhard (Marie) Stejneger	1
Frank Stephens	2
Dr. William Stimpson	2
Dr. George Suckley	6
Prof. F. Sumichrast	2
A. S. Taylor	1
Gen. G. H. Thomas, U. S. A.	4
Prof. Zadock Thompson	2
Aurelius Todd	1
C. H. Townsend	12
Lieut. W. P. Trowbridge, U. S. A.	7
Dr. F. W. True and Dr. D. W. Prentiss, jr	1
Lucien M. Turner	5
W. T. Van Dyck	1
Dr. E. P. Vollum	2
Col. B. L. C. Wailes	1
John Wallace	1
Dr. W. S. White	1
George D. Wilder	1
William Wittfield	1
Erich Wittkügel	2
H. D. Wolf	1
Dr. S. W. Woodhouse	5
Gustav Wurdemann	1
John Xantus	6
Robert T. Young	3
José C. Zeledon	5
Ernst Zollikofer	2
Collector unknown [a]	12
	696

AUTHORS WHO HAVE DESCRIBED TYPE-SPECIMENS OF MAMMALS IN THE COLLECTION OF THE UNITED STATES NATIONAL MUSEUM, BIOLOGICAL SURVEY COLLECTION.

Dr. J. A. Allen	16
Dr. Knud Andersen	2
Vernon Bailey	42
Merritt Cary	2
E. A. Goldman	17
Dr. Walter L. Hahn	1
Arthur H. Howell	8
Dr. E. A. Mearns, U. S. A.	1
Dr. C. Hart Merriam	480
Gerrit S. Miller, jr.	19
E. W. Nelson	39
Wilfred H. Osgood	70
Edward A. Preble	15
Frank Stephens	1
	713

[a] Of these 1 was purchased from Ward's Natural Science Establishment, 4 from C. K. Worthen, 1 from Wilhelm Schlüter, 1 received from John Varden, and 2 from the U. S. Bureau of Fisheries.

COLLECTORS OF TYPE-SPECIMENS OF MAMMALS IN THE COLLECTION OF THE UNITED STATES NATIONAL MUSEUM, BIOLOGICAL SURVEY COLLECTION.

J. F. Abbott	1
G. S. Agersborg	1
A. W. Anthony	5
F. B. Armstrong	4
H. P. Attwater	2
G. B. Badger	1
Vernon Bailey (see also Merriam and Bailey)	70
Vernon Bailey and Dr. B. H. Dutcher, U. S. A.	3
A. B. Baker	1
C. M. Barber	3
B. J. Bretherton	5
C. S. Brimley	1
Herbert Brown	1
F. Brune	1
A. S. Bunnell	1
John Burlingame	1
Merritt Cary	5
C. Catt	1
H. A. Cluff	1
B. L. Cunningham	3
Dall DeWeese	1
G. F. Dippie. (See Mackay and Dippie.)	
Dr. B. H. Dutcher, U. S. A. (see also Bailey and Dutcher)	7
H. and C. Emmet	1
G. T. Emmons	1
Dr. B. W. Evermann	1
E. E. Fast	1
Dr. A. K. Fisher	14
Prof. R. T. Fisher	1
Dr. W. K. Fisher	7
J. H. Gaut	2
H. A. Gaylord	1
E. A. Goldman (see also Nelson and Goldman)	29
L. J. Goldman	5
M. M. Green	2
C. Hansen	1
Prof. J. B. Hatcher	1
T. Hays	1
E. Heller. (See Osgood and Heller.)	
N. Hollister	2
J. C. Ingersoll	1
D. N. Keagi	2
H. H. Keays	1
Rev. J. H. Keen	5
J. H. Kidder	1
C. A. Lambert	1
G. Leonard	1
W. Lloyd	6
J. Alden Loring	17
D. H. Luckey	1
G. M. McGuire	1
E. A. McIlhenny	1
J. E. McLellan	12
W. G. Mackay and G. F. Dippie	1
A. G. Maddren. (See Osgood and Maddren.)	
C. H. Marsh	1
C. J. Maynard	1
Dr. C. Hart Merriam	13
Dr. C. Hart Merriam and Vernon Bailey	22
Dr. C. Hart Merriam and E. W. Nelson	1
A. C. Murray	1
E. W. Nelson (see also Palmer and Nelson)	78
E. W. Nelson and E. A. Goldman	227
H. C. Oberholser	1
Wilfred H. Osgood	13
Wilfred H. Osgood and E. Heller	5
Wilfred H. Osgood and A. G. Maddren	2
C. Palache	1
Dr. T. S. Palmer	10
Dr. T. S. Palmer and E. W. Nelson	1
W. Pavlof	1
Alfred E. Preble (see also Preble and Preble)	1
Edward A. Preble	14
Edward A. and Alfred E. Preble	2
J. M. Priour	1
A. Rea	1
Dr. C. W. Richmond	4
Prof. W. E. Ritter	1
De Alton Saunders	1
P. Schmid	2
C. Sheldon	2
C. H. Smith	1
Frank Stephens	8
J. T. Stewart	1
C. P. Streator	48
A. H. Thayer	1
R. J. Thompson	2
R. S. Weldon	1
A. G. Wetherby	1
Chief of Yakutat Indians	1
Robert T. Young	1
Unknown	1
	713

INDEX.

[Names and page references of minor importance are printed in *italics*.]

A.

D.

I.

J.

K.

P.

Q.

R.

S.

O